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ABSTRACT

The Graduate Medical Education National Advisory Committee's (GMENAC) report on the present and future supply and requirements of physicians by specialty and geographic location is provided. Part I presents a listing of Panel recommendations and options for addressing the problem, while Part II presents an introduction to this report. Part III summarizes Charge 1--a description of the underlying problem, a literature review of physician location factors, a representation of data by specialty by county, and recommendations for further efforts at data collection. Part IV summarizes Charges 2 and 3, detailing empirical evidence of variations in per capita expenditures and rates of surgical procedures. It also reviews the literature on procedure rate variation studies, providing implications of the variations for manpower policy. Criteria for acceptable levels of equity and access using the indicators of physician to population ratios and travel times to service are presented in Part V. Problems of data utilization, as well as recommendations for the level of geographic analysis that should be employed, are also expanded on in Part V. Part VI summarizes Charges 4, 5, and 6 linking the work of the Geographic Distribution Panel with that of the Financing, Nonphysician Provider, and Educational Environment Panels, and presents a taxonomy of "strategies" or programs that might be implemented to address distributional and access problems. Strengths and weaknesses of the past, present, and potential programs are discussed, as well as extensive documentation on each of the mechanisms. Among the 31 recommendations made by the Panel are: serious attention should be given to making available to physicians their utilization rate experiences relative to the norms of other physicians practicing in their immediate region, area, or in the nation; economic incentives and/or the provision of higher payment levels for service as an inducement for physicians to practice in underserved areas should be explored; and the effectiveness of government loan and scholarship programs should be cataloged and evaluated. A review of the literature on physician distribution is appended. (Author/LC)

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Report of the Graduate Medical Education National Advisory Committee

to the Secretary, Department of Health and Human Services

Volume III

Geographic Distribution
Technical Panel

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The Report of the Graduate Medical Education National Advisory Committee to the Secretary, Department of Health and Human Services, consists of seven volumes:

Volume I	GMENAC Summary Report
Volume II	Modeling, Research, and Data Technical Panel
Volume III	Geographic Distribution Technical Panel
Volume IV	Financing Technical Panel
Volume V	Educational Environment Technical Panel
Volume VI	Nonphysician Health Care Providers Technical Panel
Volume VII	GMENAC Members' Commentaries and Appendix

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to the Secretary, Department of Health and Human Services

Volume III

Geographic Distribution Technical Panel

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September 30, 1980

The Honorable Patricia Roberts Harris
Secretary
Department of Health and Human Services
Washington, D.C. 20201

Dear Madam Secretary:

The attached Report of the Graduate Medical Education National Advisory Committee (GMENAC) is in fulfillment of the Committee's responsibilities under the Charters of April 20, 1976, and March 6, 1980.

The charge of the Committee was to advise the Secretary on the number of physicians required in each specialty to bring supply and requirements into balance, methods to improve the geographic distribution of physicians, and mechanisms to finance graduate medical education.

GMENAC significantly advanced health manpower planning in direct and indirect ways.

> GMENAC introduced new scientific methodology: Two new mathematical models were developed to estimate physician supply and requirements.
>
> GMENAC refined the data bases; figures for estimating the supply of practitioners in every specialty and subspecialty from the distribution of first-year residency positions have been developed.
>
> GMENAC integrated the estimates of supply and requirements for physicians with nurse practitioners, physician assistants, and nurse midwives.
>
> GMENAC introduced new concepts to clarify assessment of the geographic distribution of physicians and services; standards are proposed for designating areas as adequately served or underserved based on the unique habits of the people in the area.
>
> GMENAC recommends that medical service revenues continue to provide the major source of funds to support graduate medical education.
>
> GMENAC has initiated a collaboration between the private sector and the Government; the unique expertise of each achieves a level of comprehensiveness in health manpower planning not previously experienced.

GMENAC estimates a surplus of 70,000 physicians by 1990. Most specialties will have surpluses, but a few will have shortages. A balance by 1990 cannot be achieved. Until supply and requirements reach a balance in the 1990s, GMENAC recommends that the surplus be partially absorbed by expansion of residency training positions in general/family practice, general pediatrics, and general internal medicine.

Recommendations are directed at achieving five manpower goals:

1. To achieve a balance between supply and requirements of physicians in 90s, while assuring that programs to increase the representation of minority groups in medicine are advanced by programs to broaden the applicant pool with respect to socio-economic status, age, sex, and race;

2. to integrate manpower planning of physicians and nonphysician providers when their services are needed, and to facilitate the function of nonphysician providers;

3. to achieve a better geographic distribution of physicians and to establish improved mechanisms for assessing the adequacy of health services in small areas;

4. to improve specialty and geographic distribution of physicians through financing mechanisms for medical education, graduate medical education, and practice, and

5. to support research for the next phases of health manpower planning.

The Committee unanimously recommends the immediate establishment of a successor to GMENAC. Its establishment is essential to the implementation of the manpower goals and recommendations in the Report. The full GMENAC methodology must be applied to the six specialties which have not been analyzed. The requirements estimates for each of the specialties and subspecialties must be tested, monitored, and reassessed on a continuing basis. Important studies on financing, geography, and nonphysician providers should be undertaken.

The collaborative working relationship between the private sector and the Government facilitated a congruence of interest in planning and in implementing improvements to best meet the needs of the Nation. The momentum of this collaboration should be continued without interruption.

Respectfully submitted,

Alvin R. Tarlov

Alvin R. Tarlov, M.D.
Chairman
Graduate Medical Education
National Advisory Committee

For the Committee

Enclosure: Volumes I-VII

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RECOMMENDATIONS OF THE GEOGRAPHIC DISTRIBUTION TECHNICAL PANEL

I. Monitoring and Evaluating the Distribution of Physicians and Services

1. Determination of medical market areas
2. Data systems
3. Population based data
4. Collection of utilization rate variation data
5. Dissemination of utilization rates to physicians
6. Dissemination of aggregate statistics
7. Outcome Studies
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10. Minimum acceptable travel times
11. Health manpower shortage area criteria

II. Future Research

12. Factors affecting location choice
13. Economic factors
14. Evaluation of programs
15. Selective admissions
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III. Undergraduate/Graduate Medical Medical Education Institutions

18. Role model development and preceptorships
19. Family practice training programs
20. Residency/education experiences
21. Nonphysician provider training programs
22. Decentralized medical education
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IV. Medical Students/ Residents

24. National Health Service Corps
25. Loans and scholarships
26. Area Health Education Centers
27. Loan forgiveness (Federal and State)

V. Practicing Physicians

28. RHI, RHC and HURA evaluations
29. Group practices
30. Geographic shortage area differentials
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I. SUMMARY OF GEOGRAPHIC PANEL RECOMMENDATIONS

RECOMMENDATION 1: The functional medical service areas, specialty by specialty, are recommended as the geographic unit for assessing availability of physician services. The Graduate Medical Education National Advisory Committee (GMENAC) also recommends that physician market areas by specialty be determined empirically based on patient origin data derived from such information as discharge and claims data, until such time as total enumeration of physician services is possible, and that the resulting areas be compared to those previously determined by specialty societies. The specialties of dermatology, obstetrics-gynecology, orthopedics, and neurosurgery have developed methods for determining the market areas for their respective specialties based on zip codes, economic service areas, and time-to-service concepts. (See pp. 18-19, Chapter III)

RECOMMENDATION 2: GMENAC supports the evaluation of alternative data systems for monitoring of geographic distribution of providers. (See pp. 18-19, Chapter III)

RECOMMENDATION 3: GMENAC urges the use of small area population based data on the availability, requirements for and utilization rates of hospital and physician services as a manpower planning tool. (See Chapter IV)

RECOMMENDATION 4: GMENAC urges that the ranges of variations in the utilization of specific procedures and services among service populations and communities be collected and analyzed (including communities with differing financing and organizational arrangements for the delivery of medical care services). (See Chapter IV)

RECOMMENDATION 5: Serious attention should be given to making available to physicians their utilization rate experiences relative to the norms of other physicians practicing in their immediate area, region, or in the Nation. (See p. 53, Chapter IV)

RECOMMENDATION 6: Serious attention should be given to the voluntary collection and dissemination for analytical purposes of aggregate statistics relative to utilization rates in various service areas. (See pp. 52-53, Chapter IV)

RECOMMENDATION 7: GMENAC encourages the support of efforts within the profession to assess the outcomes of common medical and surgical practices which exhibit high variation across communities as an important step for establishing the long-range requirements for suppliers of medical services in the United States. (See pp. 51-53, Chapter IV)

RECOMMENDATION 8: Future health manpower planning groups should compare manpower estimates (whether derived as a "need-based", "demand-based," or "requirements-based" model) against empirical estimates selected from areas in the United States which exhibit high and low utilization patterns. (See pp. 47-51 and pp. 53-56, Chapter IV)

RECOMMENDATION 9: GMENAC recommends that five basic types of health care services should be available within some minimum time/access standards: Adult medical care, child care, obstetrical services, surgical services, and emergency services. In order to monitor the geographic distribution of physicians, GMENAC recommends that a minimum acceptable physician-to-population ratio for all areas in the U.S. be established. It is recommended that 50 percent of the GMENAC Modeling Panel ratio of physician specialists per 100,000 for 1990 be established as the minimum acceptable ratio for all areas. (See pp. 62-65, Chapter V)

RECOMMENDATION 10: GMENAC recommends maximum travel times of 30 minutes for emergency medical care, 30 minutes for adult medical care, 30 minutes for child medical care, 45 minutes for obstetrical care, and 90 minutes for surgical care services for 95 percent of the population in 1990, recognizing that unusual circumstances may arise which make these travel times impossible to achieve for all areas. (See pp. 65 and 71-76, Chapter V)

RECOMMENDATION 11: GMENAC recommends that the definition of health manpower shortage area include minimum physician/population ratios and a minimum travel time to service for general surgery, emergency medical services, and obstetrical services. (See pp. 73 and 76, Chapter V)

RECOMMENDATION 12: Incomplete information exists on the direction of causation of many of the factors affecting physician location. Additional research is needed to study (1) how background factors such as sociodemographic factors affect specialty and location choices and the interaction between specialty and location choices and (2) what factors affect permanent location choices in underserved/rural areas. (See pp. 43-46, Chapter IV)

RECOMMENDATION 13: Since the role of economic factors in location choice is not clear, attempts should be made to improve methodologies to determine this role and to gather data on previously nonquantifiable topics such as income as a motivating force in specialty or location choices. (See pp. 43-46, Chapter III)

RECOMMENDATION 14: Those strategies which GMENAC deemed most promising, such as preceptorships and tax incentives, and those which are most amenable to evaluation efforts, should be evaluated more vigorously. (See pp. 77-110, Chapter VI)

RECOMMENDATION 15: There is some evidence that selective admissions policies may improve the geographic distribution of physicians. A nationally mandated alteration in admissions policies is not recommended at this time; further study into the location decisions of students with particular ethnic or sociodemographic characteristics is recommended. (See pp. 77-78, Chapter VI)

RECOMMENDATION 16: Economic incentives (such as tax credits and deductions) and/or the provision of higher payment levels for services as an inducement for physicians to practice in underserved areas should be explored. (See pp. 78-80, Chapter VI)

RECOMMENDATION 17: Demonstration projects should be developed and evaluated to determine the impact of differential rates of reimbursement for technology-intensive versus time-intensive (counseling, patient education) services upon the geographic distribution of physicians and services. (See pp. 80-81, Chapter VI)

RECOMMENDATION 18: It is recommended that practicing physicians and faculty convey to students that the practice of medicine can be delivered in a variety of geographic settings, including both rural and urban shortage areas. As a means of accomplishing this, urban and rural preceptorships for medical students should be continued and expanded in schools with an interest in monitoring such programs. (See pp. 81-86, Chapter VI)

RECOMMENDATION 19: Given the geographic distributional patterns of family practitioners, graduate medical education programs in family medicine should continue to be supported as a strategy to increase primary care services in certain geographic areas of underservice. (See pp. 87-88, Chapter VI)

RECOMMENDATION 20: Incentives should be created to broaden residency education experiences to encompass training in underserved areas, provided the appropriate resources are available and standards of education of the relevant accrediting body are met. (See pp. 88-89, Chapter VI)

RECOMMENDATION 21: Data suggest that nonphysician health care providers favorably affect the distribution of medical services by their tendency to select shortage area locations more frequently than is the case with physicians. It is recommended that nonphysician health care provider training programs should continue to be supported for this reason. (See pp. 89-91, Chapter VI)

RECOMMENDATION 22: Decentralized medical education programs such as WAMI (in Washington, Alaska, Montana, and Idaho) and WICHE (Western Interstate Commission for Higher education) were developed to coordinate medical education and placement programs in a relatively isolated and sparsely populated region. These types of programs have been effective and attention should be given to their replicability. (See pp. 91-92, Chapter VI)

RECOMMENDATION 23: GMENAC encourages the medical profession, through its training program directors and various specialty societies, in making decisions as to residency training programs, to consider, in addition to the quality of residency programs, the aggregate number of programs, their size, and the geographic distribution of their graduates to better meet national and regional needs. (See pp. 92-93, Chapter VI)

RECOMMENDATION 24: The National Health Service Corps (NHSC) and the NHSC Scholarship Program for increasing the availability of primary care physician services in designated health manpower shortage areas impact favorably on the geographic distribution of physicians; therefore, the NHSC and the NHSC Scholarship Program should continue to be supported. (See pp. 93-94, Chapter VI)

RECOMMENDATION 25: Government sponsored loan and scholarship programs should be catalogued and evaluated to determine their effectiveness in improving the geographic distribution of physicians. (See pp. 94-95, Chapter VI).

RECOMMENDATION 26: Despite limited evaluation, there is evidence that several Area Health Education Center (AHEC) models are effective in inducing physicians to practice in underserved areas and/or to practice primary care. These types of AHECs should receive continued support. (See pp. 95-97, Chapter VI)

RECOMMENDATION 27: Loan forgiveness programs modeled after those which have been successful should be used as a strategy for attracting physicians into underserved areas. (See pp. 97-99, Chapter VI)

RECOMMENDATION 28: Comprehensive evaluations of programs to recruit and retain providers in underserved areas (e.g., Rural Health Initiative, Rural Health Clinics, Health Underserved Rural Area Program) should be performed after a reasonable period of time. Continued funding of these programs should be contingent upon a positive evaluation of their effectiveness. (See pp. 99-100, Chapter VI)

RECOMMENDATION 29: Programs that foster or support group practice arrangements in rural areas, coupled with the appropriate communication and transportation networks, should be developed or established on an experimental basis as a means of attracting physicians to rural communities. If these delivery modes prove to be successful in delivering care to underserved areas, start-up funding should be encouraged for new programs. (See pp. 100-103, Chapter VI)

RECOMMENDATION 30: Discontinuation of geographic differentials in payment levels by third-party payors when this is in excess of differences in costs of delivering those services as a means of influencing geographic distribution should be the subject of future research. Present reimbursement systems (Federal, State and private) tend to sustain historical differences in fees and incomes among geographic areas and thus provide incentives for physicians to locate in high income communities within metropolitan areas. (See pp. 103-105, Chapter VI)

RECOMMENDATION 31: GMENAC recommends that all physicians, both those in primary care specialties and those in nonprimary care specialties, be reimbursed at the same payment level for the same primary care services. (See pp. 105-110, Chapter VI)

II. INTRODUCTION AND OVERVIEW OF CHARGES TO THE GEOGRAPHIC PANEL

The Graduate Medical Education National Advisory Committee (GMENAC) was created in April 1976 as an advisory body to the Secretary of Health, Education, and Welfare. The Charter of GMENAC mandated that recommendations be made by September 1980 on the present and future supply and requirements of physicians by specialty and geographic location. Despite a 31 percent increase in the aggregate supply of active physicians over the 1965-75 decade, the specialty and geographic distribution of physicians and the assurance of equal access to health services by all segments of the population has caused continuing concern. The overriding questions of how many specialists and generalists are needed for a given size population in a given geographic area remain highly controversial. The Geographic Distribution Technical Panel of GMENAC was established to address these concerns.

The central goal of the Geographic Panel since its inception in March 1979 was to develop options and recommendations to assist in reducing the unequal accessibility and availability of medical care services amongst communities. The Geographic Panel has looked at a wide range of issues relating to geographic considerations, including the relative importance of reimbursement and life style, the different problems of rural and urban areas, the effect of geographic origin on students' decisions to locate, and procedure rate variations by small areas.

The Geographic Panel at its initial meeting proposed to report on eight topics, listed as "Charges" to the Panel (Table 1). The charges were approved in May 1979 by the GMENAC as a whole, and work proceeded on the development of documentation in each area. Beginning with the first charge, which was aimed at identifying the underlying causes of the geographic problem, the Panel described what currently existed in the area of physician distribution, what should exist in terms of acceptable levels of variations in manpower, and what could be done to redress any imbalances. The last charge (No. 8) presented a series of options and a compendium of recommendations on the other areas (See V1).

The Interim Report of GMENAC described the distribution of total physicians on three levels of geography--the Health Services Area (HSA), the State, and the county. Only data on selected States were presented. The Geographic Panel has expanded on this presentation, providing data on 21 specialties by each county, HSA, and State in the United States for full-time equivalent physicians. Also analyzed and debated were many of the problems of utilizing data on these levels of aggregation.

Table 1

GEOGRAPHIC DISTRIBUTION PANEL FINAL CHARGES

1. Identify the underlying causes of the unequal distribution (availability and utilization) of physicians in the United States. Describe and analyze data on rates of physicians per capita in 22 specialties by the smallest geographic area possible (e.g., county, health service area, zip code).

2. Describe the variations in per capita expenditures for and rates of medical/surgical services among selected communities; relate these variations to local physician distribution and project the implications for future manpower needs.

3. Given that local physician supply will always vary, what criteria can be used to indicate acceptable levels of variations in local physician supply, per capita rates of medical and surgical use, and per capita expenditures for medical services.

4. Analyze the potential impact and record to date of programs such as the National Health Service Corps, Area Health Education Centers, and Rural Health Clinics in terms of eliminating gross distributional problems.

5. In conjunction with the Educational Environment Panel, identify how the sociodemographic characteristics and educational experiences of students affect the decision of practice location.

6. In conjunction with the Financing Panel, determine if financial incentives for practitioner and training institutions might be used to effect more equitably distributed medical services.

7. In conjunction with the Modeling Panel, identify distributive characteristics for each of the 22 specialties and describe the impact of these characteristics on the recommendations derived from each specialty model.

8. Given the existing and projected number of providers by specialty, recommend how issues of geographic over- and undersupply could be corrected.

The organization of the Panel's report is a follows: Part I presents a listing of Panel recommendations and options for addressing the problem, while Part II presents an Introduction to this report. Part III summarizes Charge 1--a description of the underlying problem, a literature review of physician location factors, a presentation of data by specialty by county, and recommendations for further efforts at data collection.

Part IV summarizes Charges 2 and 3, detailing empirical evidence of variations in per capita expenditures and rates of surgical procedures. It also reviews the literature on procedure rate variation studies, providing implications of the variations for manpower policy. Criteria for acceptable levels of equity and access using the indicators of physician to population ratios and travel times to service are presented in Part V. Problems of data utilization, as well as recommendations for the level of geographic analysis that should be employed, are also expanded on in Part V. Part VI summarizes Charges 4, 5, and 6 linking the work of the Geographic Distribution Panel with that of the Financing, Nonphysician Provider, and Educational Environment Panels, and presents a taxonomy of "strategies" or programs which might be implemented to address distributional and access problems. Strengths and weaknesses of past, present, and potential programs are discussed, as well as extensive documentation on each of the mechanisms.

The Appendix to this Report is a review of the literature on physician distribution.

III. PHYSICIAN DISTRIBUTION: AN ANALYSIS OF ITS CAUSES

Under Charge No. 1, which was aimed at "identifying the causes of the unequal distribution of physicians" and describing and analyzing data on physicians, the Geographic Panel addressed the question of geographic disparity, provided an understanding of the nature, causes, and extent of the problem, and identified reasons for physician location decisions. This charge was addressed in two parts: A presentation of data on the current distribution of physicians and a literature review of reasons for variations in the distribution.

DATA ON THE DISTRIBUTION OF PHYSICIANS IN THE U.S.

It was necessary to first investigate the current levels of physician specialty distribution by the geographic area closest to the true physician market area in order to determine where physicians by specialty were located. This data can assist in an assessment of what actions would be necessary to address the problem of unequal distribution. The data presented are for 1975, and do not indicate trends over time.

Data on Specialty Distribution

Data are presented in this section for the total number of non-Federal physicians in the U.S. and for 18 specific specialty classifications. The specialty classifications (listed in Table 2) are grouped according to those of the Modeling Panel Delphi Groups of GMENAC. Data are analyzed for the District of Columbia and for each county in the U.S. in addition to State and national aggregates. Physician data were self-reported for 1975 as recorded on the American Medical Association (AMA) Physician master file tape and include only private practice physicians. County population estimates are those of Bureau of the Census Series P-26 for 1975 as recorded on the Bureau of Health Profession's Area Resource File.

The figures do not necessarily represent the number of persons engaged in the practice of the specialty. A physician indicating more than one practice specialty will be counted in more than one specialty using the appropriate full-time equivalent (FTE) figures. The resident population figures represent all residents of an area, including military and institutional populations.

Table 2

SELECTED PHYSICIAN DISTRIBUTION STATISTICS BY SPECIALTY, 1975

Specialty	Number of Physicians in U.S.	Physicians per 100,000 Population in U.S.	Number of Counties Without Physician	Percent of All Counties (3084)	County Ratios per 100,000 Population: 50th Percentile	90th Percentile	100th Percentile
All Specialties	307,155	144.2	167	5.4%	52.8	122.8	1299.4
Adult Medicine	109,615	51.4	180	5.8%	32.9	57.6	485.9
General Practice/ Family Practice	49,521	23.2	208	6.7%	25.2	47.4	136.4
Internal Medicine	48,459	22.7	1633	53.0%	0.0	15.7	380.8
Cardiovascular Diseases	6,381	3.0	2377	77.1%	0.0	3.0	28.2
Gastroenterology	1,945	.9	2730	88.5%	0.0	.5	25.0
Pulmonary Disease	1,885	.9	2700	87.5%	0.0	.7	43.5
Allergy	1,424	.7	2703	87.6%	0.0	.6	55.6
General Surgery	31,640	14.8	1202	39.0%	5.8	16.1	108.5
Obstetrics	21,177	9.9	1881	61.1%	0.0	10.1	55.9
Pediatrics	20,399	9.5	1978	64.1%	0.0	8.2	86.0
Psychiatry	19,525	9.1	2144	69.5%	0.0	6.8	104.2
Orthopedic Surgery	10,666	5.0	2218	71.9%	0.0	6.1	74.6
Ophthalmology	8,952	4.2	2079	67.4%	0.0	5.2	53.0
Urology	6,092	2.8	2256	73.2%	0.0	3.7	35.8
Otolaryngology	4,791	2.2	2366	76.7%	0.0	2.7	58.8
Dermatology	3,372	1.5	2504	81.2%	0.0	1.7	52.9
Neurosurgery	2,886	1.3	2675	86.7%	0.0	1.2	23.5
Plastic Surgery	2,066	.9	2750	89.2%	0.0	.6	44.4
Thoracic Surgery	2,044	.9	2668	86.5%	0.0	.9	19.6

The American Medical Association Physician Classifications Grouped to Correspond with GMENAC Delphi Panel is as follows:

GMENAC Grouping	Corresponding AMA Specialties
Adult Medicine	General practice (includes family practice) Internal Medicine Cardiovascular disease Gastroenterology Pulmonary disease Allergy
Dermatology	Dermatology
General Surgery	General Surgery
Neurosurgery	Neurosurgery
Obstetrics/Gynecology	Obstetrics/Gynecology
Ophthalmology	Ophthalmology
Orthopedic Surgery	Orthopedic Surgery
Otolaryngology	Otolaryngology
Pediatrics Pediatric cardiology Pediatric allergy	Pediatrics
Plastic Surgery	Plastic Surgery
Psychiatry	Psychiatry Child psychiatry
Thoracic Surgery	Thoracic Surgery
Urology	Urology

For each of the 14 histograms of all counties in the U.S. on pages 21-42, the 3,084 counties of 50 States plus the District of Columbia are grouped according to their physician/population ratios for each specialty so that approximately 10 percent of the counties cluster into each group. (See Figures 1-14) The widths of the intervals determined for each specialty were used to create histograms of counties in each State. As a consequence, comparisons of the distribution of county physician/population ratios within a State to the distribution of all counties in the United States are facilitated.

The vertical axis illustrates the percent of all counties in the State or Nation, whichever the case may be, whose physician/population ratios for the specialty in question fall within a particular interval. The exact percent is listed as the first data item in each decile group along the horizontal axis. The next two numbers under the percent figure are the width of the interval.

The fourth number indicates the number of counties whose ratios fall within the interval. It should be noted that the horizontal axis is not to scale and that the range is FTE physicians per 100,000 population.

Data are presented for full-time equivalent (FTE) physicians. Responses to the opportunity to list up to three specialties and the number of hours per week worked in each for the AMA survey are the basis of the FTE counts which consider both differences in hours worked and specialty. The mean number of hours per week worked by all physicians in the U.S., approximately 60, are used to calculate FTEs for each specialty that a physician lists.* Then the number of FTEs in each specialty for a county is summed and rounded to the nearest integer. State and national totals are the summation of rounded county figures. It should be noted that the AMA derived FTE counts do not differ substantially from simple head counts of physicians by specialty.**

Histograms were created for all physicians and for 13 specialties of physicians organized according to the GMENAC Modeling Panel's Delphi Groups. County-specific histograms on active non-Federal physicians were generated from the 1975 AMA master file of self-reported data. Any physician who indicated he or she was not retired, on sabbatical, etc., was considered an active physician.

In 1975 there were 307,155 active, non-Federal physicians of all specialties in the U.S. or 144.2 physicians per 100,000 population (See Table 2 - Selected Statistics by Specialty). Figure 1 illustrates the disparate geographic distribution pattern of physicians of all specialty types. The median county ratio was 52.8 physicians per 100,000 population indicating that half of the counties had ratios higher and half had ratios lower than 52.8. Ten percent of counties had ratios between 122.8 and 129.4 physicians per 100,000 population. It should be noted that the intervals necessary to cluster ten percent of U.S. counties' physician/population ratios grow increasingly larger after the 50th percentile, indicating a broad right tail distribution.

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* While significantly higher and different from the Mendenhall data presented at the July 20, 1979 GMENAC meeting, these numbers should give figures with correct relative orders of magnitude.

** Abt Associates' analysis of differences among head counts, distributed head counts, and FTE figures by county using Chi-square analysis shows only about 2 percent of U.S. counties (about 62) having significant (95 percent confidence interval) differences among the counts. (1979)

The 109,615 FTE physicians practicing adult medicine are slightly more than one third of all physicians and are distributed similarly to physicians of all specialty types. Although there are 51.4 FTE adult medicine physicians per 100,000 population in the Nation, more than 80 percent of all U.S. counties have lower physician/population ratios. The adult medicine histogram, Figure 2, shows a median county physician/population ratio of 32.9 FTE physicians per 100,000. Further, 90 percent of all counties had less than 57.6 FTE adult medicine practitioners per 100,000. The highest county ratio was 458.9, and there were 35 counties with more than 100 FTE adult medical practitioners per 100,000 population. At the other extreme only 180 counties (5.3 percent) had no adult medicine physician in 1975.

The distribution of FTE physicians practicing adult medicine within individual States is quite striking. For example, 62.1 percent of California counties (36) had 47.4 FTE adult medicine physicians per 100,000 or higher while only 20.1 percent of all U.S. counties had ratios in this range (Figure 2.1). At the other extreme, only 11.9 percent of California counties (7) had county physician/population ratios less than or equal to the national median of 32.9. Many other examples could be given. The distribution of physicians within individual States does not usually reflect the distribution of physicians across the Nation.

Because county units have widely varying numbers of people and physical geographies, one would expect the distribution of physicians to be related to some degree to population concentration. It is intuitive that the probability of a county having a physician of a particular specialty type increases as the size of a county in terms of population increases. That physician-to-population ratios vary widely across counties with populations of similar size is not always intuitive. Similarly, counties with comparable physician-to-population ratios often have widely varying populations.

Analysis of physician-to-population ratios for adult medicine by size of county populations reveals varied distributions across counties with particular ranges of population and across counties with similar physician-to-population ratios. Of the 197 counties with no adult practitioner, 90 percent had county populations of less than 10,000. However, the 785 counties with populations under 10,000 displayed a remarkable range of ratios. About 23 percent of these had adult practitioner ratios between 10 and 29 physicians per 100,000 population as Table 3 shows. At the other extreme almost 2 percent of these counties had ratios of more than 100 adult practitioners per 100,000 population. This 2 percent of counties with populations under 10,000, however, represented 42 percent of all counties with physician-to-population ratios of 100 or more adult practitioners per 100,000 population, and counties of all population sizes examined were represented by this ratio. While it is quite true that the probability of a county having an adult practitioner increases with county size, the distribution of the physicians among counties of similar size is varied and no simple relationship exists. Similarly no simple relationship exists for the distribution of counties by size within a range of physician-to-population ratios.

The varied relationships between county size and physician-to-population ratios found for the specialty of adult practitioner also hold for pediatricians and plastic surgeons. Further, investigation of other specialties should yield similar conclusions about the distribution of counties by population size and physician-to-population ratio. The relationships for the specialties of pediatrics and plastic surgery have been analyzed and are consistent with those for adult medicine.

Table 3

DISTRIBUTION OF ADULT PRACTITIONER TO POPULATION RATIOS
FOR COUNTIES WITH LESS THAN 10,000 POPULATION

	Practitioners to Population Ratios per 100,000 Population					
	0	10-29	30-49	50-69	70-99	100+
Number of Counties	179	224	207	113	48	14
% of counties with populations under 10,000	22.8%	28.5%	26.4%	14.4%	6.1%	1.8%
% of all counties with each ratio	90.8%	21.4%	16.4%	29.1%	44.4%	42.4%

Another way that physician distribution data can be analyzed is by health service area (HSA). The National Health Planning and Resources Development Act of 1974 (P.L. 93-641) created approximately 200 local planning agencies and health service areas. Guidelines for the creation of health service areas showed a clear intention to preserve local trading patterns by the requirement that Standard Metropolitan Statistical Areas (SMSAs) be preserved to the maximum extent possible. Further stipulations on HSA population size and the designation of areas may result in health service areas being more appropriate approximations of market areas for some specialties of physicians than county areas. Data on 202 HSAs designated in 1975 show a substantially tighter range of distribution--from 24.5 FTE adult medicine physicians per 100,000 to 139.0 per 100,000. The HSA median ratio of 42.2 and 90th percentile of 63.6 are both higher than the corresponding county ratios for the Nation.

The 31,640 FTE general surgeons in the U.S. have a somewhat less diffuse distribution than those physicians practicing adult medicine. Although there are 14.8 FTE general surgeons per 100,000 population, 39 percent (1,202) of all counties do not have a physician of this type (Figure 3). The median county general surgeon/population ratio is 5.8, and 10 percent of all counties have more than 16.6 FTE general surgeons per 100,000 population. The highest ratio is 108.5 per 100,000, and only 30 counties have ratios higher than 30 FTE surgeons per 100,000.

Distribution of general surgeons within States again is marked. Whereas 39 percent of all U.S. counties do not have any general surgeons (Figure 3), 8.6 percent of California counties (Figure 3.1), 32.7 percent of Alabama counties (Figure 3.2), and 57.1 percent of Colorado counties (Figure 3.3) have no general surgeon. At the other extreme some 20 percent of U.S. counties have 12.4 or more FTE general surgeons per 100,000 while California, Colorado, and Alabama have 37.9 percent, 20.6 percent and 10.5 percent of their respective counties' physician population ratios in this range. Consequently, compared to the U.S., California counties tend to have a disproportionate share of higher general surgeon/population ratios, Alabama has a disproportionate share of counties with ratios at or slightly above the national median, and Colorado has a disproportionate share of counties with no general surgeon.

The range of ratios for HSA areas, 4.61 to 46.4 FTE general surgeons per 100,000, is also smaller than that for counties, 0 to 108.5. Only five of 202 health service areas have ratios less than the median county ratio for the U.S., 5.8. The median HSA ratio is 11.3 and the 90th percentile is 19.76. In the highest group of HSA ratios, there were 19.76 and 25.0 FTE general surgeons per 100,000.

The histograms for obstetrics, pediatrics, psychiatry, orthopedic surgery, ophthalmology, urology, otolaryngology, dermatology, neurosurgery, plastic surgery, and thoracic surgery, Figures 4-14, illustrate patterns of geographic distribution radically different from those of all specialties, adult medicine, or general surgery. The number and percent of counties without physicians of these specialties are striking, from 64.1 percent of all counties without a pediatrician to 89.2 percent of all counties without a plastic surgeon. As a consequence, the distribution of pediatricians, psychiatrists, orthopedic surgeons, ophthalmologists, urologists, otolaryngologists, dermatologists, neurosurgeons, plastic surgeons, and thoracic surgeons tends to be concentrated in a small proportion of counties. The broad ranges of the 10th deciles further emphasize the concentration of these specialties in relatively few geographic areas. Significantly less than 10 percent of all counties have pediatrician/population or psychiatrist/population ratios which equal or exceed the national ratios of 9.5 and 9.1 per 100,000 respectively.

Once again many California counties appear to have a disproportionate share of physicians by specialty, illustrating their uneven distribution across the Nation and within States. The distribution of pediatricians within California (Figure 5.1) shows a marked cluster of counties with the highest pediatrician/population ratios whereas the opposite tends to hold for the distribution of pediatricians in Arkansas (Figure 5.2). The same pattern holds true for neurosurgery. While only 13.2 percent of all U.S. counties had a neurosurgeon, 56.9 percent of California counties (33) had a physician of this specialty (Figure 12.1). The corresponding percent of Arkansas counties is but 5.3 percent or four counties (Figure 12.2).

At the HSA level the distribution of the preceeding specialties of physicians becomes much less diverse as the area used to calculate the physician/population ratios grows in both size and population. Whereas 30.5 percent of all counties in the U.S. had a psychiatrist, all health service areas had a physician of this specialty. While only 10.8 percent of all counties have a plastic surgeon, 89.2 percent of all HSAs had a plastic surgeon. Interestingly, the range of HSA physician/population ratios for psychiatrists is from .66 FTE psychiatrists per 100,000 to 45.39 while the ranges for neurosurgeons is 0 to 5.36 and for plastic surgeons from 0 to 3.09. The median ratios are 5.04, 1.07, and .68 respectively for psychiatry, neurosurgery, and plastic surgery. The corresponding 90th percentiles are 13.66, 2.11, and 1.53 respectively.

Caveats--Physician/Population Data

In the utilization and analysis of these data it is necessary to understand caveats surrounding the use of physician/population ratios. Perhaps the most basic caveat concerns whether or not the numerator and denominator used are appropriate. Ideally the figures used would be those for market areas; the numerator would represent those physicians actually serving the residents represented in the denominator. The county ratios used here are the best current approximations of physician market areas available nationwide. It should be noted that physicians represented in the numerator may serve more than the total number of persons represented in the denominator, and all persons in a denominator because of their residence within a particular county may not receive care from numerator physicians. Market areas differ in size and population among specialties such that a county may be too small (or large) to represent service areas for some specialties accurately.

Consequently, physician/population ratios premised on county data must be interpreted cautiously because the true market areas may be different. The following section will describe in more detail the shortcomings of physician/population data and the alternative of market area data.

Data on Market Areas

Because market area data are important for the realistic analysis and resolution of manpower problems, it seems imperative to the Geographic Distribution Panel that physician market areas be determined. The weaknesses of past measures of distribution based on inappropriately defined areas are well known. The shortcomings of physician/population ratios which render them unsatisfactory as measures of distribution are summarized here, as well as in Part V of this report.

-- Availability of physician services is determined not only by the size of the manpower pool residing in an area but equally importantly by the composition and characteristics of the pool such as professional activity, that is, patient care versus nonpatient care, specialty, type of delivery mode, age, and productivity.

-- Service requirements are determined not only by population size, but also by its make-up: Age, sex, race, income, education, and willingness to travel, or proximity to another large community.

-- There is a difficulty with deriving physician/population ratios with numerators and denominators that are confined to persons who either deliver or consume health services exclusively in the designated geographical unit of observation.

-- Physician/population ratios contain numerators and denominators which are not homogeneous across geographic units of observation.

Thus, the findings of geographic distribution studies using these ratios have frequently been misrepresented and/or misinterpreted. Such research can describe the geographic unevenness of health manpower distribution in the sense that the physician distribution may depart from direct proportionality to the population distribution. But without a standard of adequacy that takes into account effective demand and requirements of the population at risk as well as the actual and potential productivity of the relevant manpower pool, unevenness of a manpower distribution should not ipso facto be translated into maldistribution.

Some of the basic flaws of physician/population ratios could be ameliorated through the use of data at the market level where the numerator would represent those physicians actually serving the residents represented in the denominator. However, until the U.S. has a system to identify all ambulatory as well as inpatient visits and salient descriptive statistics of each visit, a second best approach to the definition of service areas must be followed.

Use of claims data from Medicare, Medicaid, Blue Cross-Blue Shield, and other commercial insurers could approximate all ambulatory visits to physicians and could allow an empirical estimation of service areas. Physicians could be allocated to small geographic areas according to each area's residents' relative proportion of visits. The physicians serving the residents of each small area can then be determined, and small areas can be clustered to form the service area of a physician or group of physicians. While the use of claims data does not take into account self-pay clients' visits, only through empirical investigation of service areas for specific physicians of specific specialty types can one begin to determine generalizable characteristics of service areas.

It is imperative that the distribution of physicians by specialty be monitored at the market level since it is dynamic and changing over time as new physicians enter markets and older physicians change market areas or leave markets altogether. Consequently, a system of ongoing data collection and analysis must be put into place to assess changing distributional patterns, the success of programs to alter distributional patterns, and the attainment of societal goals for access to physician services.

At the minimum the system should monitor the number of physicians of each specialty type in each market area, their characteristics, and characteristics of area residents. At a minimum, outputs of the system would be physician/population data at the market level and summary tables and histograms based on market areas to display the ranges of distribution.

Summary

From the preceding tables, figures, and analysis, it is obvious that the distribution of all physicians or a particular specialty of physician is not uniform. As a consequence the needs and demands for care which residents of different areas have may not be met uniformly. GMENAC in its efforts to quantify the optimal number of physicians by specialty in the U.S., has considered that there is some minimal physician/population ratio for each specialty that should exist in all areas. (See Chapter V) This ratio will be affected not only by the aggregate number of specialists in the U.S., but also by the existing distributional patterns and future location tendencies of each specialty. The GMENAC Modeling Panel has sought to adjust its aggregate physician requirements to take these factors into account.

The following summarizes the findings of the Geographic Panel on the distribution of physicians and data to describe them:

1. There is a disparate geographic distribution of physicians by specialty in the U.S. as measured by county physician/population ratios. In 1975 less than 10 percent of all counties had physician/population ratios which were as high or higher than the national ratio of 144 non-Federal physicians of all specialty types per 100,000 population. There were 167 counties (5.4 percent) without a physician. The highest physician/population ratio was 1,299.4 per 100,000 population.

2. The geographic disparity is greater for some specialties, e.g., plastic surgery or neurosurgery than for others, e.g., adult medicine or general surgery.

3. Good data do not exist nationally on physician market areas by specialty.

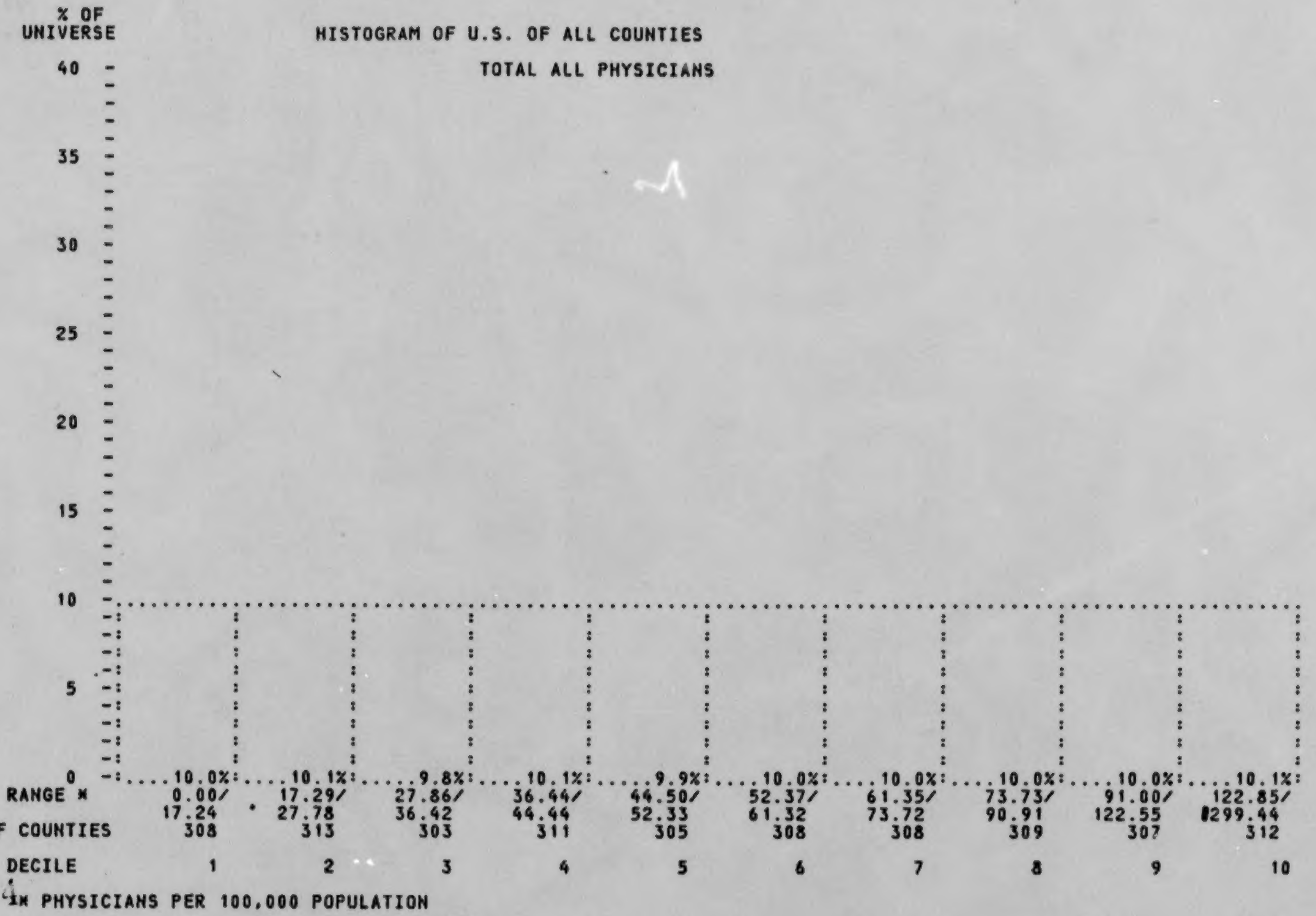
RECOMMENDATIONS

RECOMMENDATION 1: The functional medical service areas, specialty by specialty, are recommended as the geographic unit for assessing availability of physician services. It is also recommended that physician market areas by specialty be determined empirically based on patient origin data derived from such information as discharge and claims data, until such time as total enumeration of physician services is possible, and that the resulting areas be compared to those previously determined by specialty societies.

The specialties of dermatology, obstetrics-gynecology, orthopedics, and neurosurgery have developed methods for determining the market areas for their respective specialties based on zip codes, economic service areas, and time-to-service concepts.

RECOMMENDATION 2: GMENAC supports the evaluation of alternative data systems for the monitoring of the geographic distribution of providers.

Figure 1



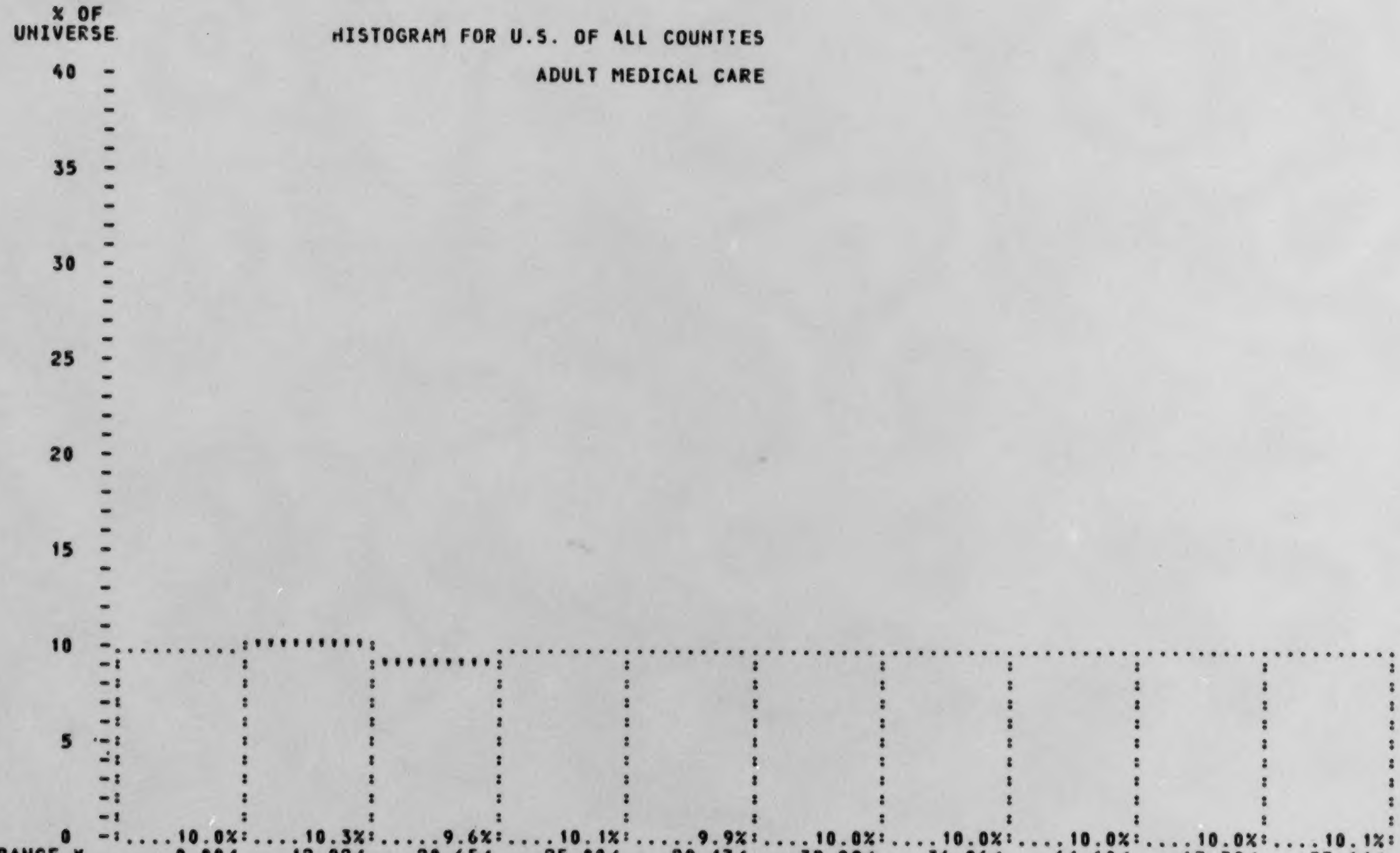
000 34

35

Figure 2

HISTOGRAM FOR U.S. OF ALL COUNTIES

ADULT MEDICAL CARE



RANGE *	0.00/ 12.90	12.92/ 20.41	20.45/ 25.00	25.08/ 29.13	29.17/ 32.88	32.89/ 36.85	36.86/ 41.38	41.40/ 47.30	47.39/ 57.55	57.61/ 485.88
# OF COUNTIES	309	318	297	311	305	308	309	307	308	312
DECILE	1	2	3	4	5	6	7	8	9	10

* PHYSICIANS PER 100,000 POPULATION

Figure 2.1

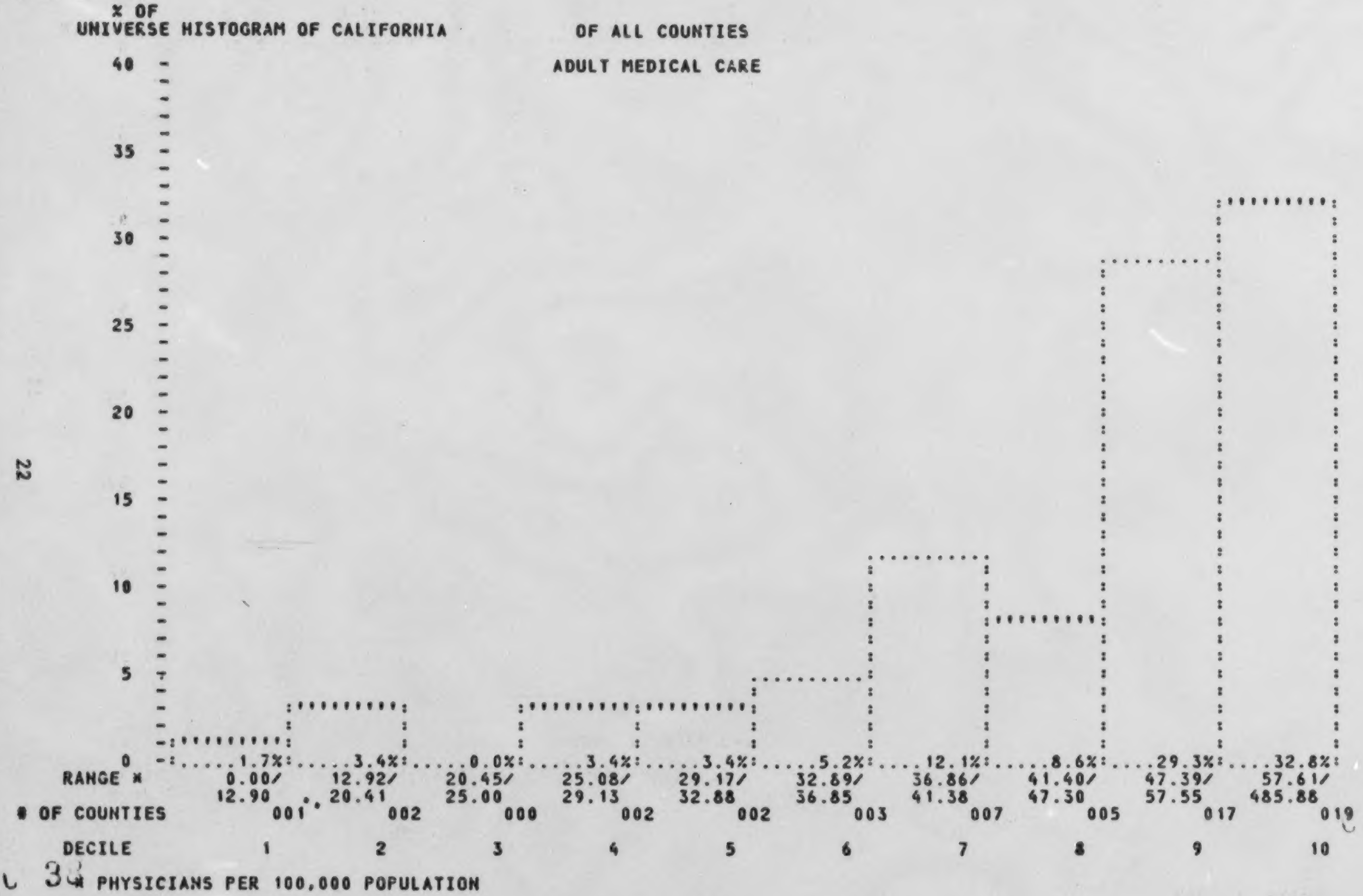
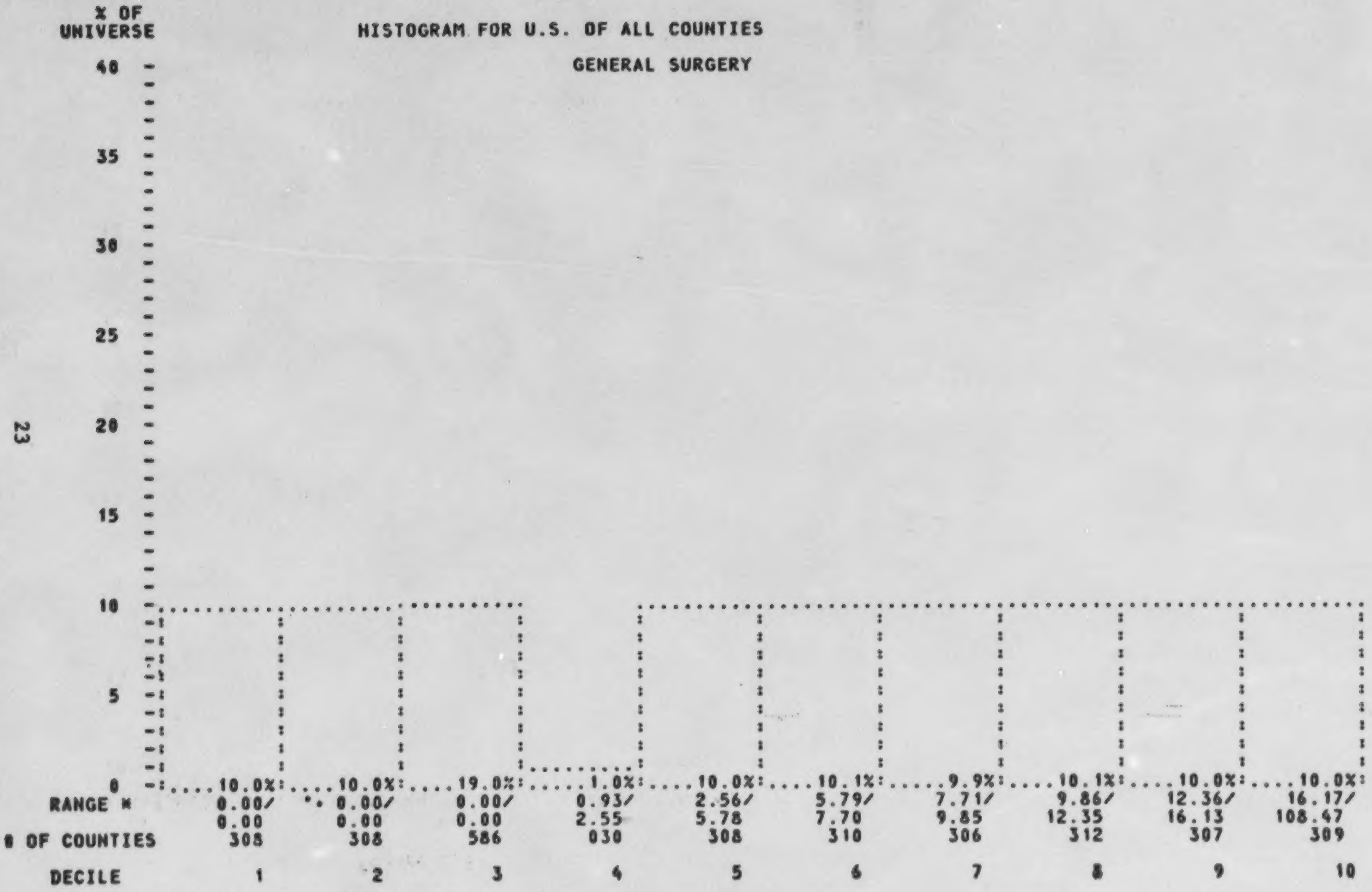

% OF UNIVERSE
HISTOGRAM OF CALIFORNIA OF ALL COUNTIES
ADULT MEDICAL CARE
40
35
30
25
20
15
10
5
0
1.7%
3.4%
0.0%
3.4%
3.4%
5.2%
12.1%
8.6%
29.3%
32.8%
RANGE *
0.00/ 12.90
12.92/ 20.41
20.45/ 25.00
25.08/ 29.13
29.17/ 32.88
32.89/ 36.85
36.86/ 41.38
41.40/ 47.30
47.39/ 57.55
57.61/ 485.88
# OF COUNTIES
001
002
000
002
002
003
007
005
017
019
DECILE
1
2
3
4
5
6
7
8
9
10
* PHYSICIANS PER 100,000 POPULATION

Figure 3

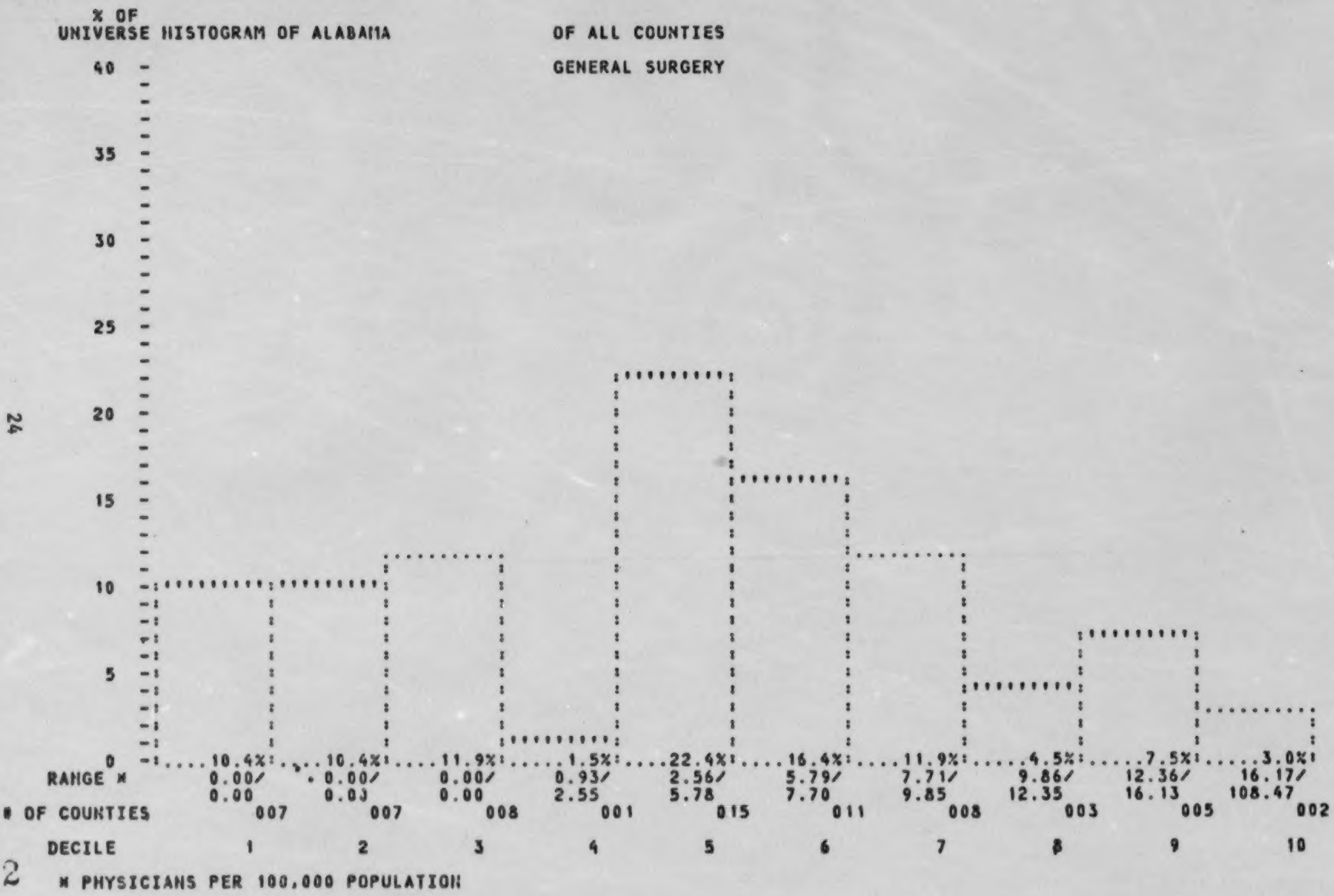


HISTOGRAM FOR U.S. OF ALL COUNTIES

GENERAL SURGERY

* PHYSICIANS PER 100,000 POPULATION

Figure 3.2


% OF UNIVERSE
HISTOGRAM OF ALABAMA
OF ALL COUNTIES
GENERAL SURGERY
40
35
30
25
20
15
10
5
0
10.4%
10.4%
11.9%
1.5%
22.4%
16.4%
11.9%
4.5%
7.5%
3.0%
RANGE *
0.00/ 0.00
0.00/ 0.03
0.00/ 0.00
0.93/ 2.55
2.56/ 5.78
5.79/ 7.70
7.71/ 9.85
9.86/ 12.35
12.36/ 16.13
16.17/ 108.47
# OF COUNTIES
007
007
008
001
015
011
008
003
005
002
DECILE
1
2
3
4
5
6
7
8
9
10
* PHYSICIANS PER 100,000 POPULATION

24

Figure 3.3

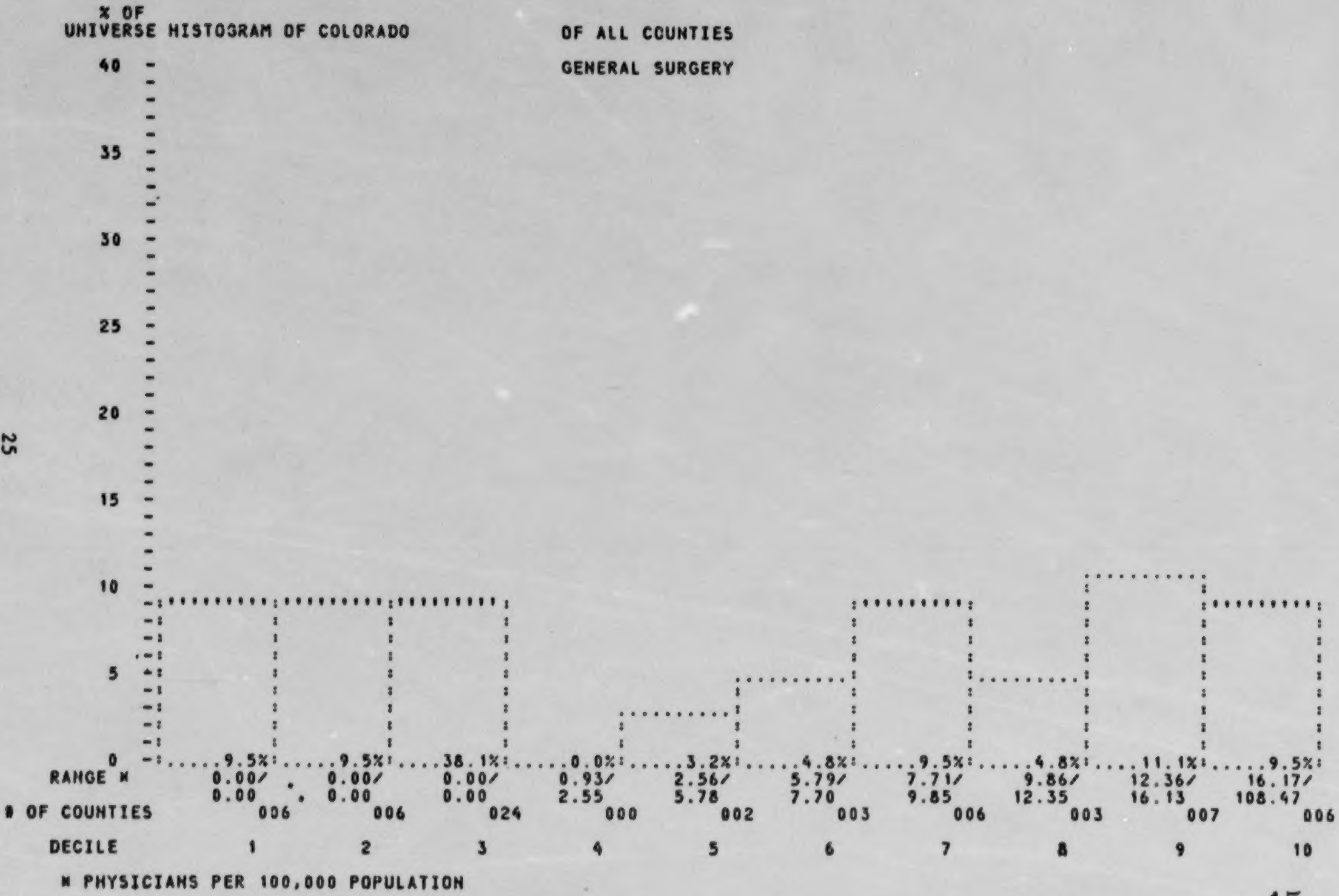
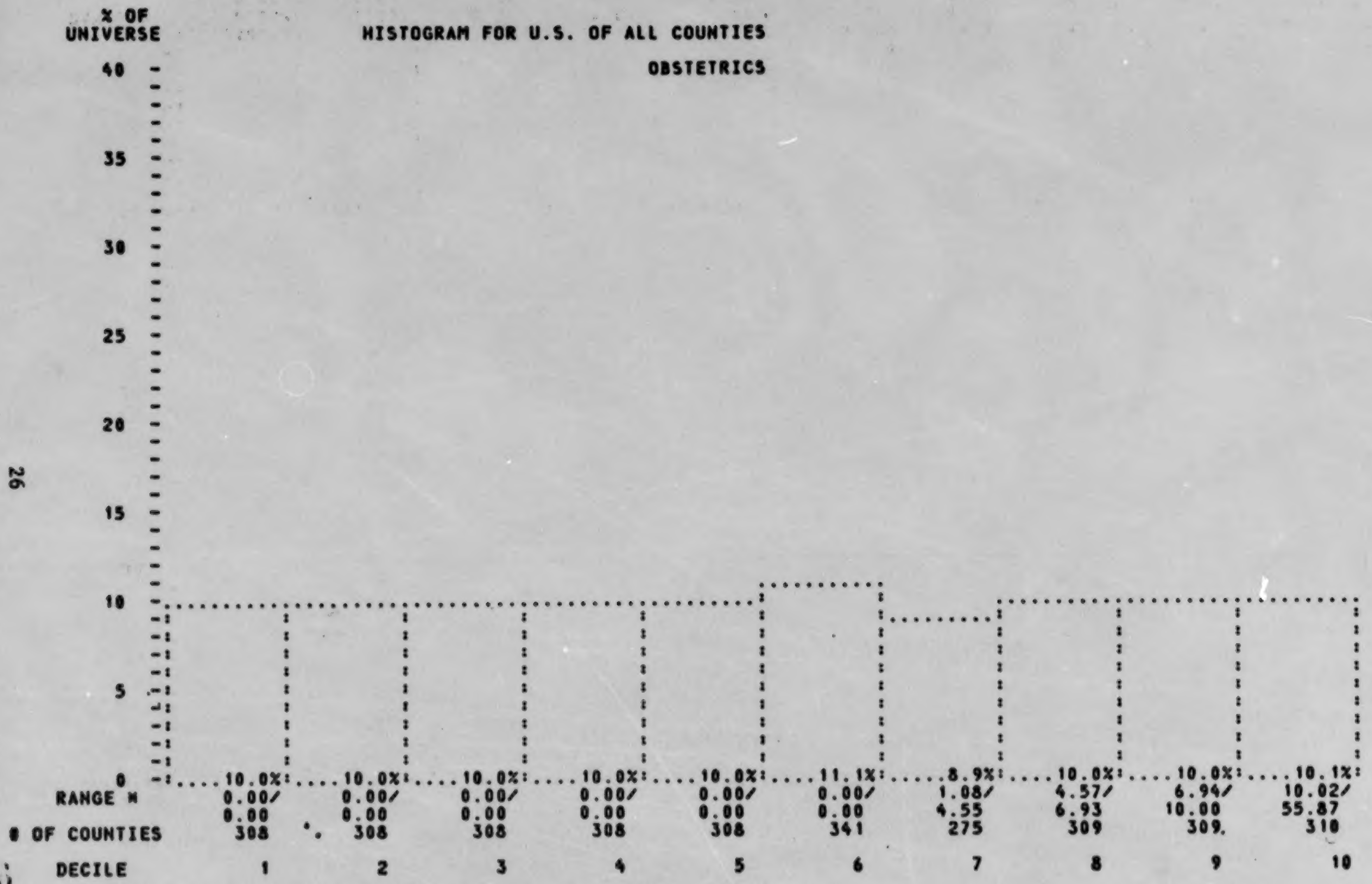

% OF UNIVERSE
HISTOGRAM OF COLORADO
OF ALL COUNTIES
GENERAL SURGERY
40
35
30
25
20
15
10
5
0
9.5%
9.5%
38.1%
0.0%
3.2%
4.8%
9.5%
4.8%
11.1%
9.5%
RANGE *
0.00/ 0.00
0.00/ 0.00
0.00/ 0.00
0.93/ 2.55
2.56/ 5.78
5.79/ 7.70
7.71/ 9.85
9.86/ 12.35
12.36/ 16.13
16.17/ 108.47
# OF COUNTIES
006
006
024
000
002
003
006
003
007
006
DECILE
1
2
3
4
5
6
7
8
9
10
* PHYSICIANS PER 100,000 POPULATION

Figure 4

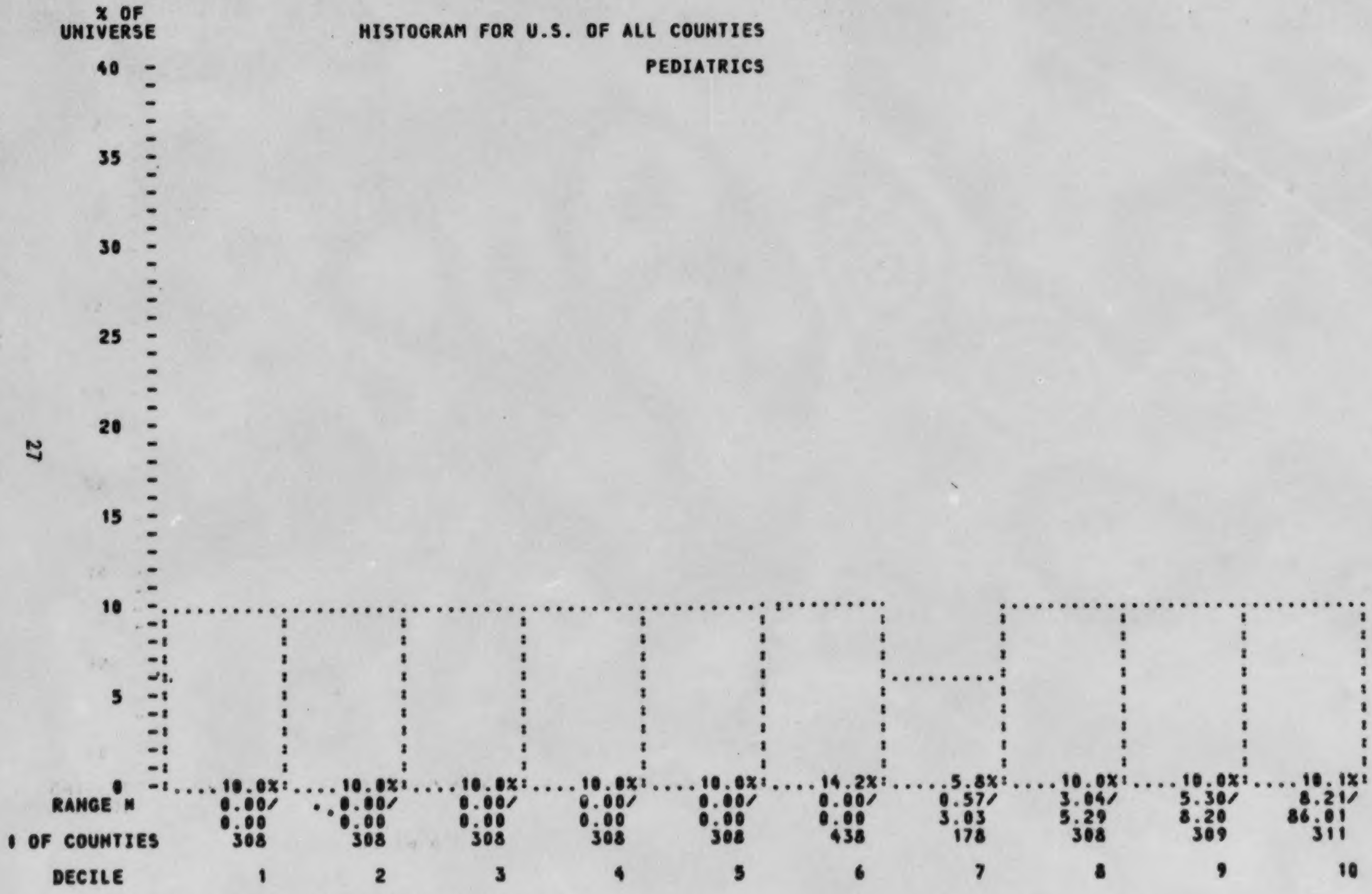


* PHYSICIANS PER 100,000 POPULATION

Figure 5

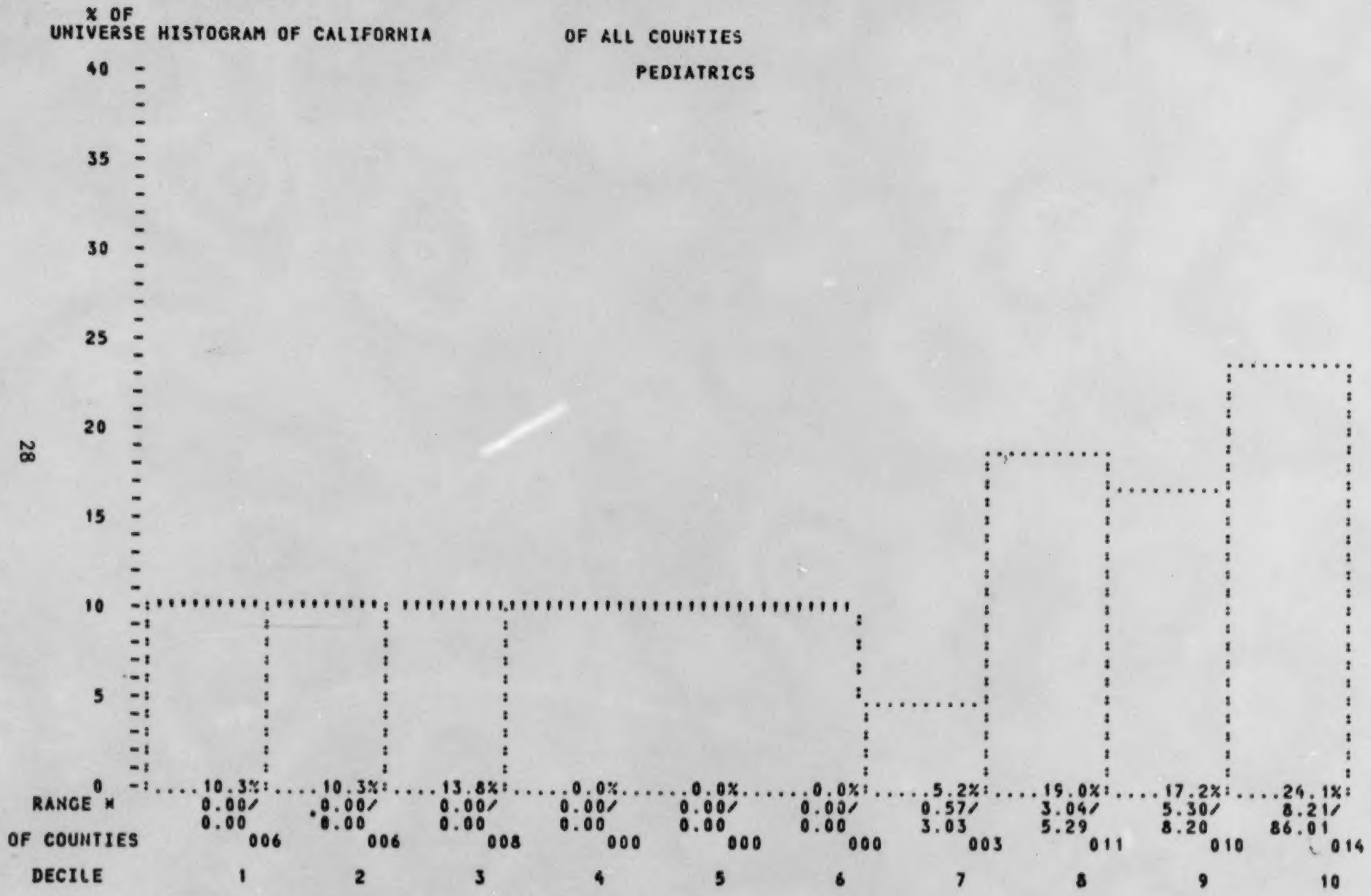
HISTOGRAM FOR U.S. OF ALL COUNTIES

PEDIATRICS



* PHYSICIANS PER 100,000 POPULATION

Figure 5.1



* PHYSICIANS PER 100,000 POPULATION

Figure 3.1

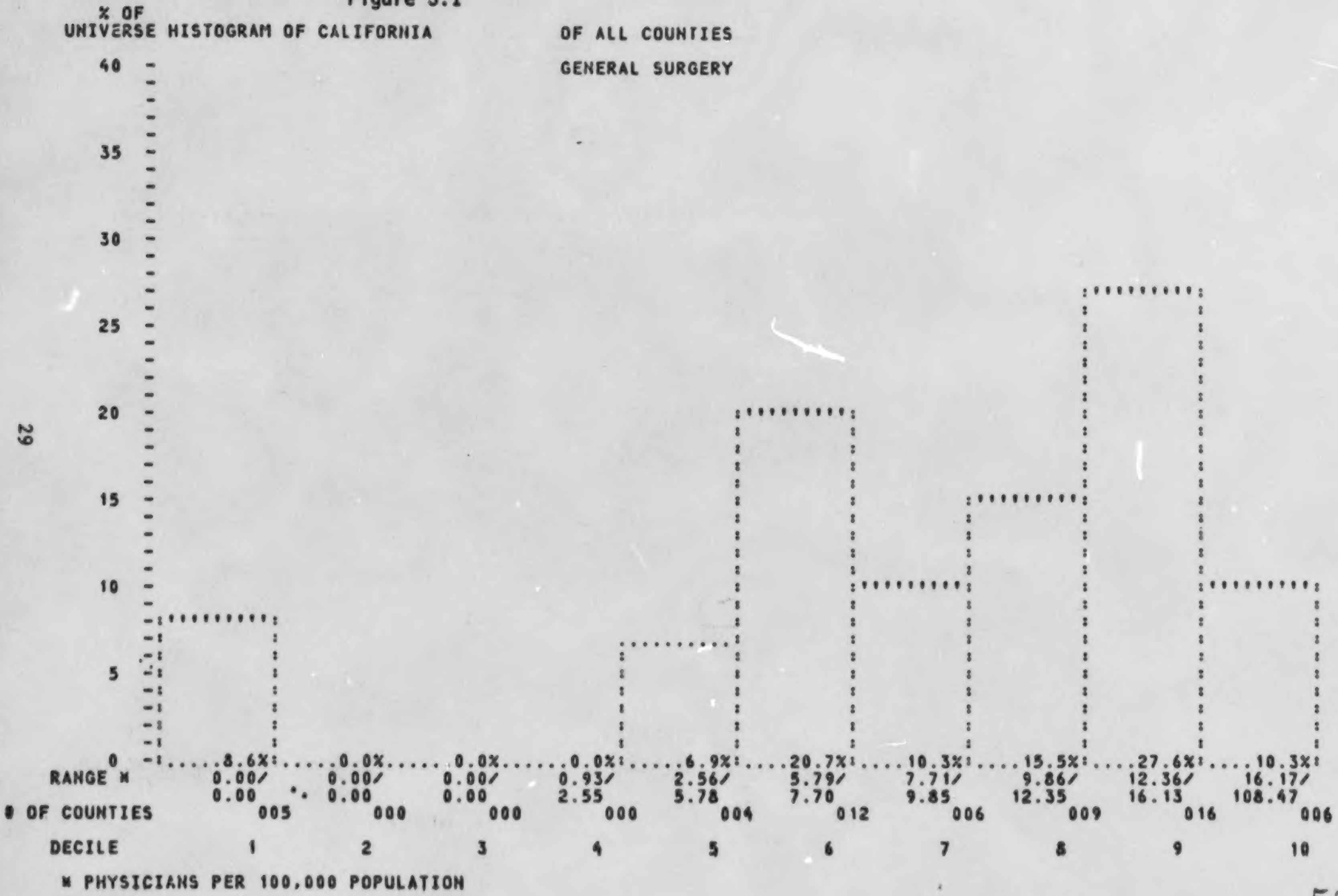
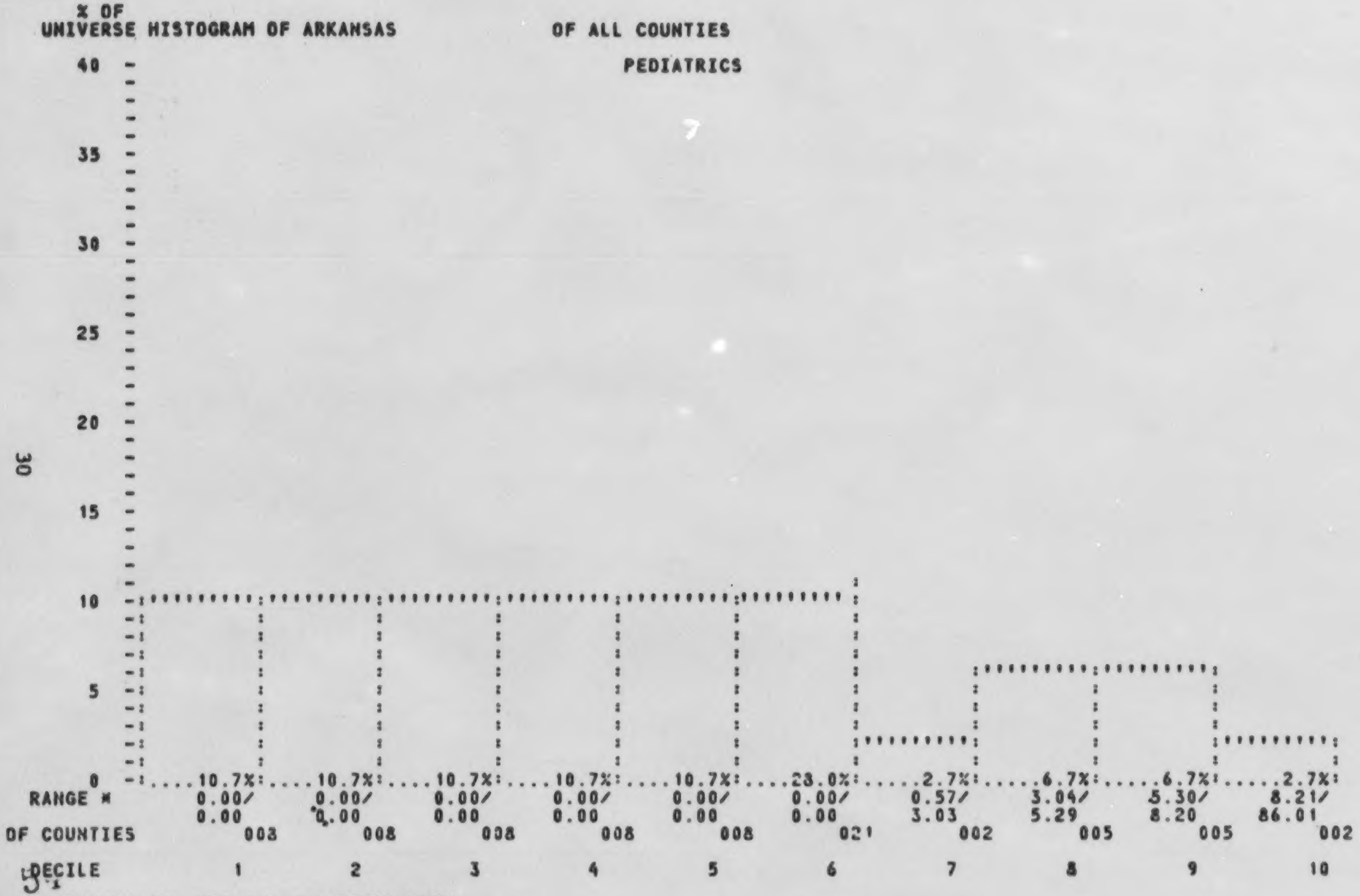

% OF UNIVERSE
HISTOGRAM OF CALIFORNIA
OF ALL COUNTIES
GENERAL SURGERY
40
35
30
25
20
15
10
5
0
8.6%
0.0%
0.0%
0.0%
6.9%
20.7%
10.3%
15.5%
27.6%
10.3%
RANGE *
0.00/ 0.00
0.00/ 0.00
0.00/ 0.00
0.93/ 2.55
2.56/ 5.78
5.79/ 7.70
7.71/ 9.85
9.86/ 12.35
12.36/ 16.13
16.17/ 108.47
# OF COUNTIES
005
000
000
000
004
012
006
009
016
006
DECILE
1
2
3
4
5
6
7
8
9
10
* PHYSICIANS PER 100,000 POPULATION

Figure 5.2



30

* PHYSICIANS PER 100,000 POPULATION

Figure 6

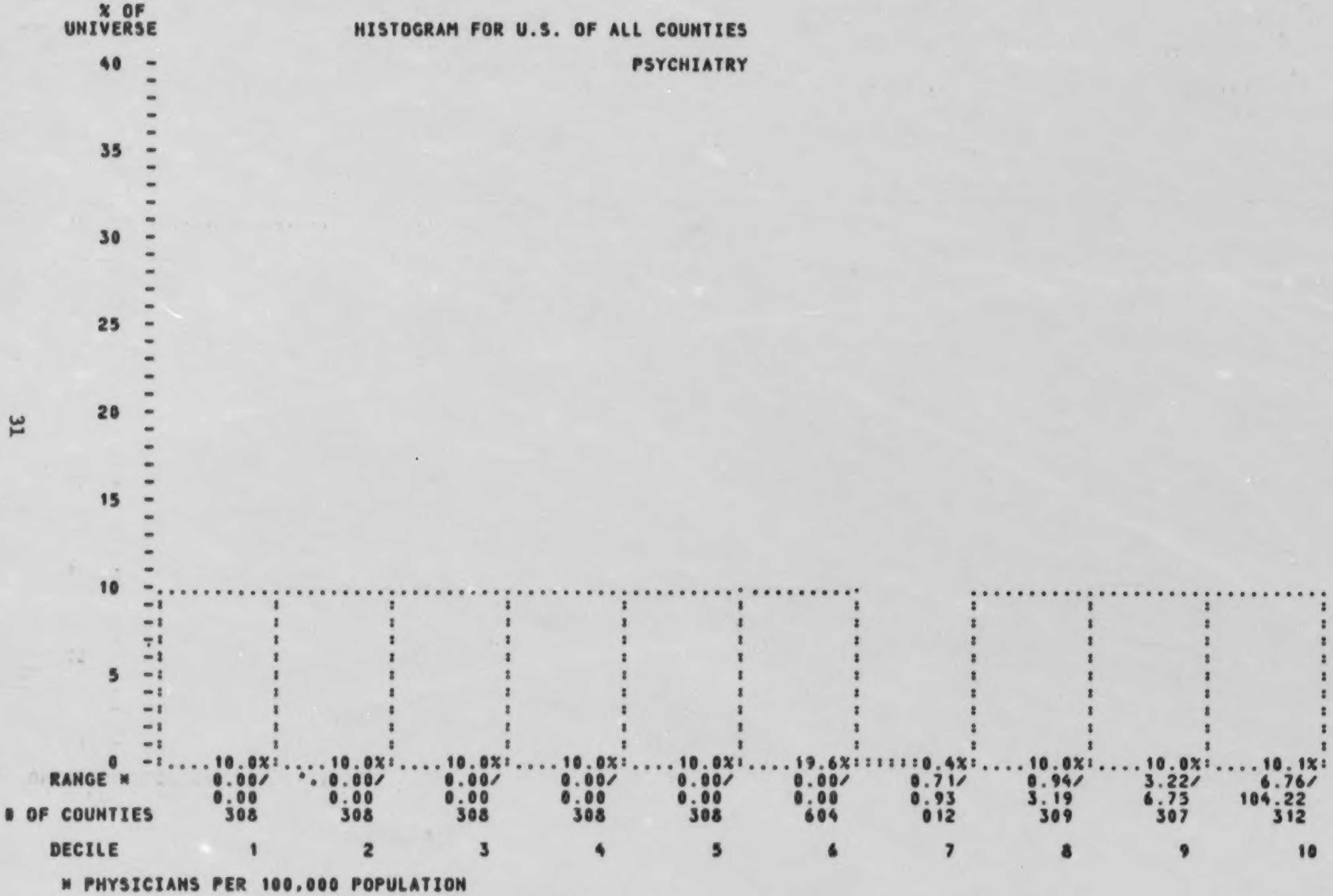
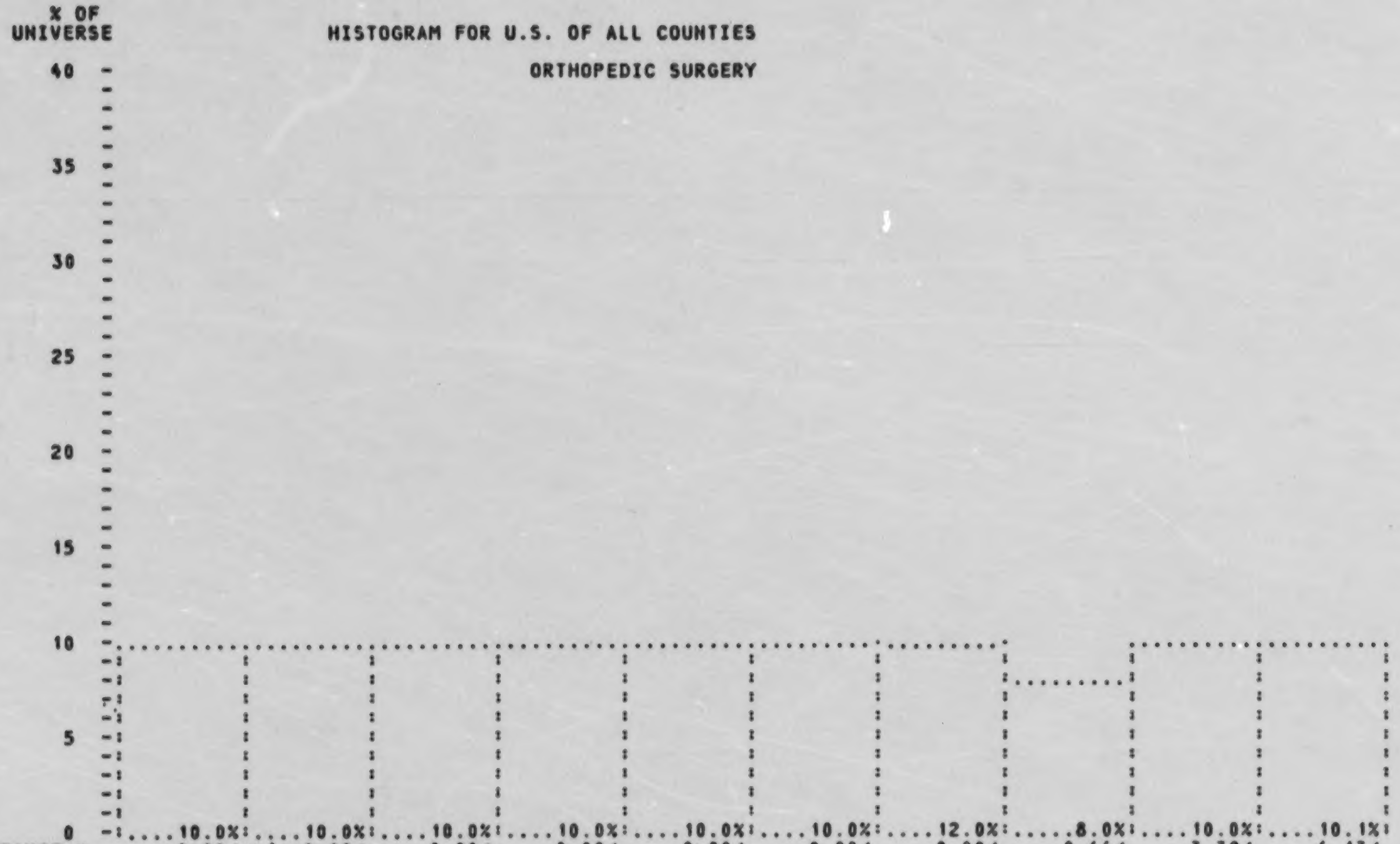

% OF UNIVERSE
HISTOGRAM FOR U.S. OF ALL COUNTIES
PSYCHIATRY
40
35
30
25
20
15
10
5
0
10.0%
10.0%
10.0%
10.0%
10.0%
19.6%
0.4%
10.0%
10.0%
10.1%
RANGE *
0.00/ 0.00
0.00/ 0.00
0.00/ 0.00
0.00/ 0.00
0.00/ 0.00
0.00/ 0.00
0.71/ 0.93
0.94/ 3.19
3.22/ 6.73
6.76/ 104.22
# OF COUNTIES
308
308
308
308
308
604
012
309
307
312
DECILE
1
2
3
4
5
6
7
8
9
10
* PHYSICIANS PER 100,000 POPULATION

Figure 7

HISTOGRAM FOR U.S. OF ALL COUNTIES

ORTHOPEDIC SURGERY



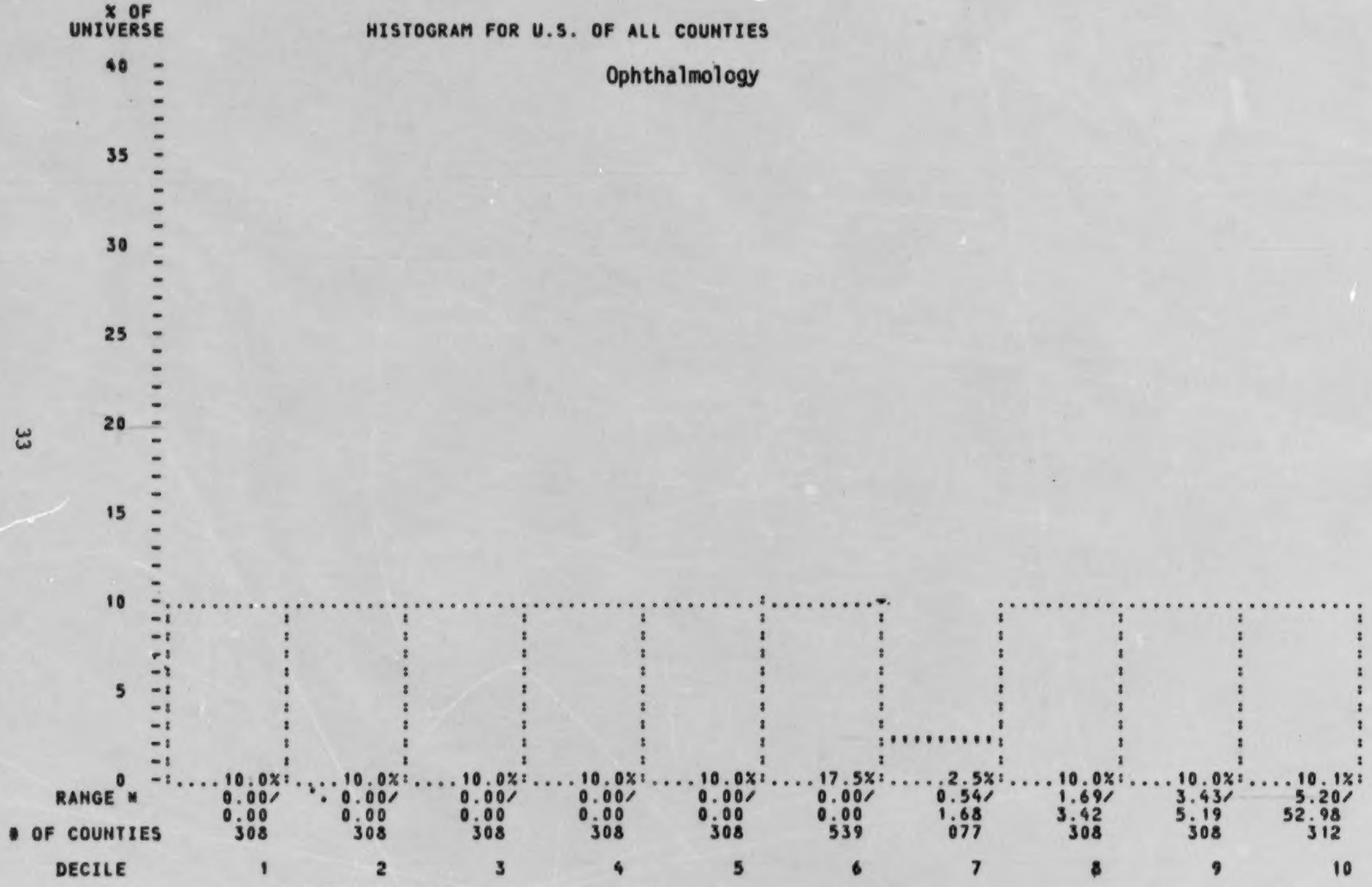
RANGE *	0.00/ 0.00	0.00/ 0.00	0.00/ 0.00	0.00/ 0.00	0.00/ 0.00	0.00/ 0.00	0.00/ 0.00	0.64/ 3.38	3.39/ 6.12	6.13/ 74.58
# OF COUNTIES	308	308	308	308	308	308	370	247	308	311
DECILE	1	2	3	4	5	6	7	8	9	10

* PHYSICIANS PER 100,000 POPULATION

Figure 8

HISTOGRAM FOR U.S. OF ALL COUNTIES

Ophthalmology

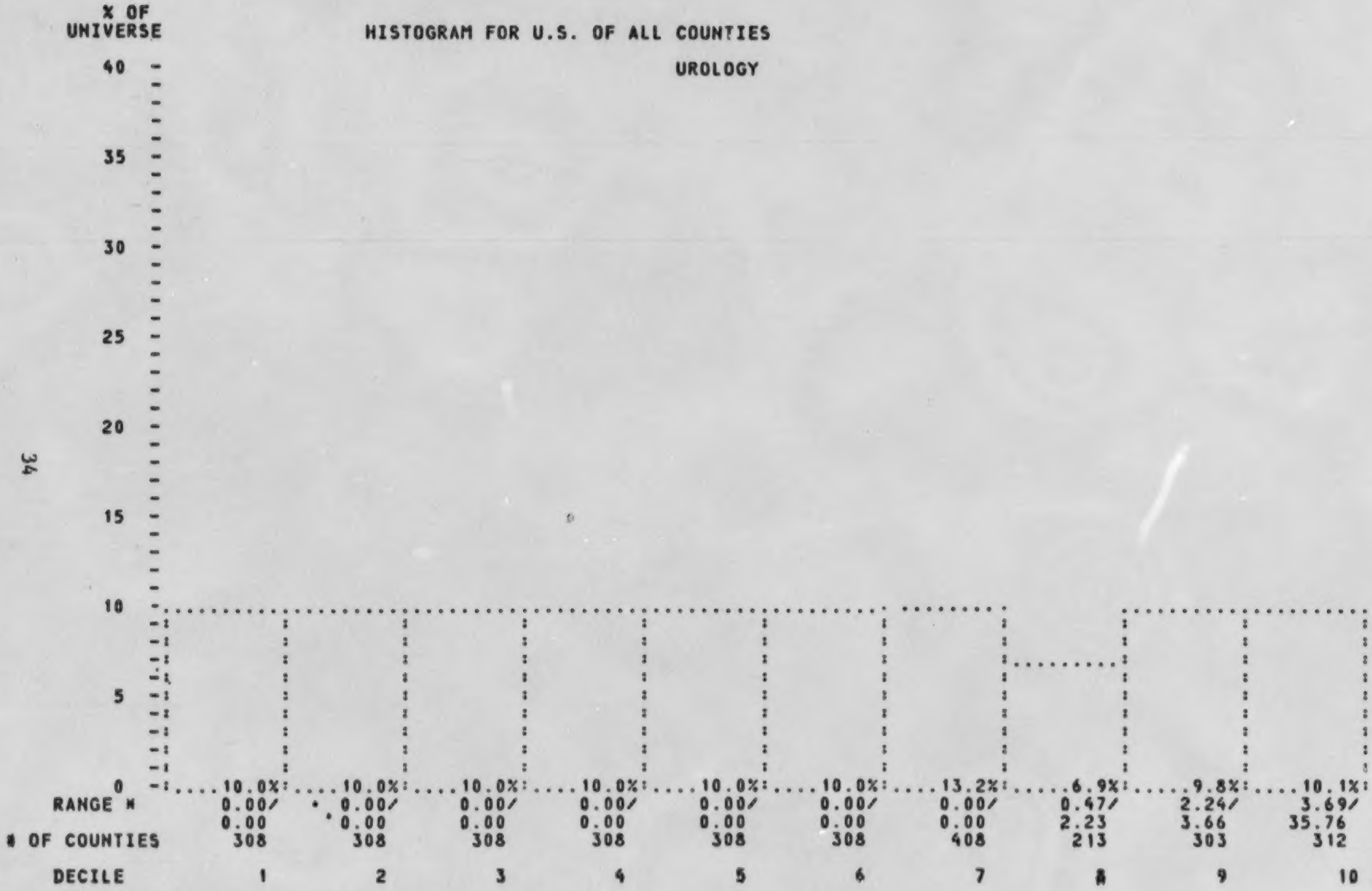


* PHYSICIANS PER 100,000 POPULATION

Figure 9

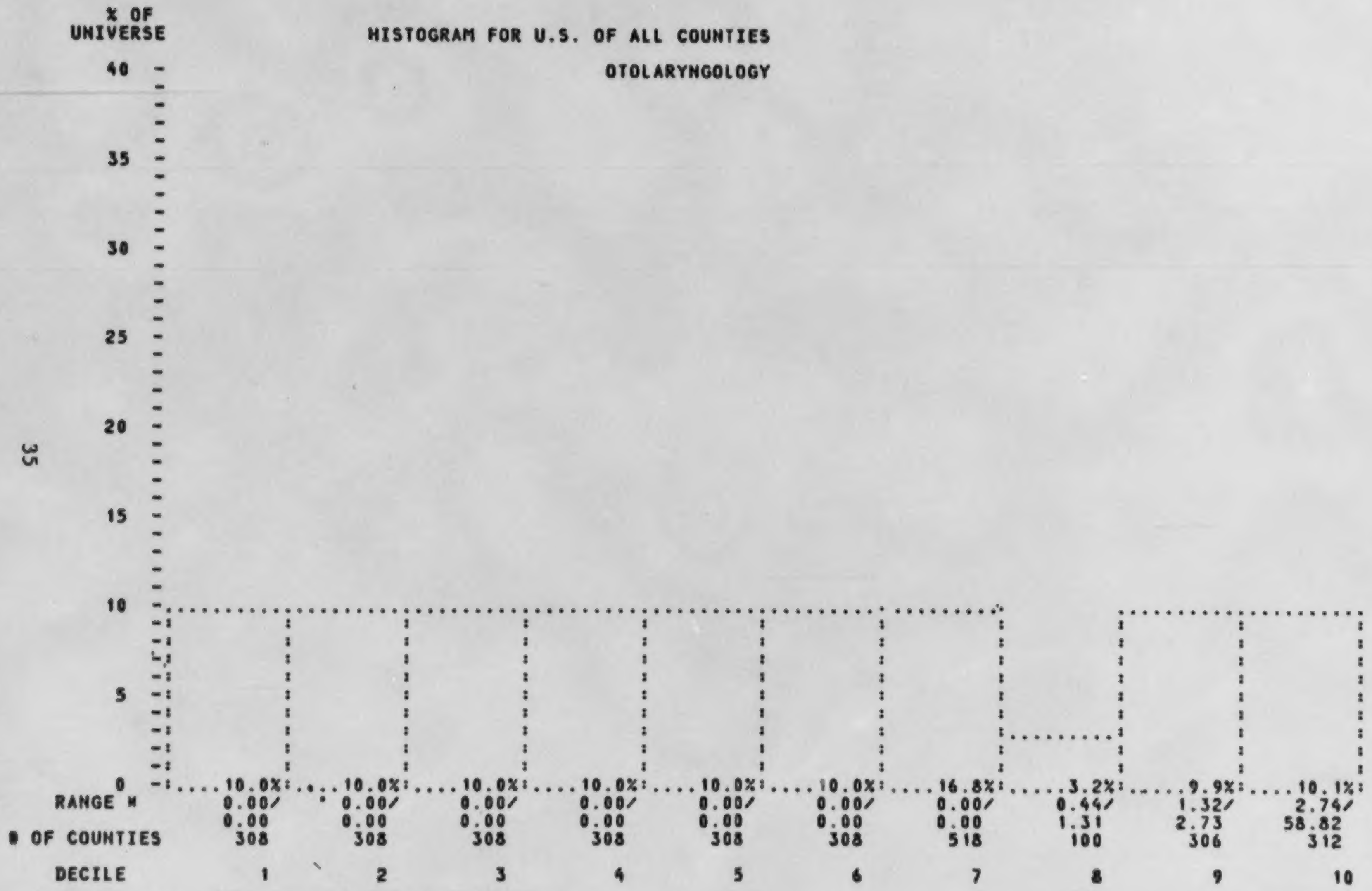
HISTOGRAM FOR U.S. OF ALL COUNTIES

UROLOGY



* PHYSICIANS PER 100,000 POPULATION

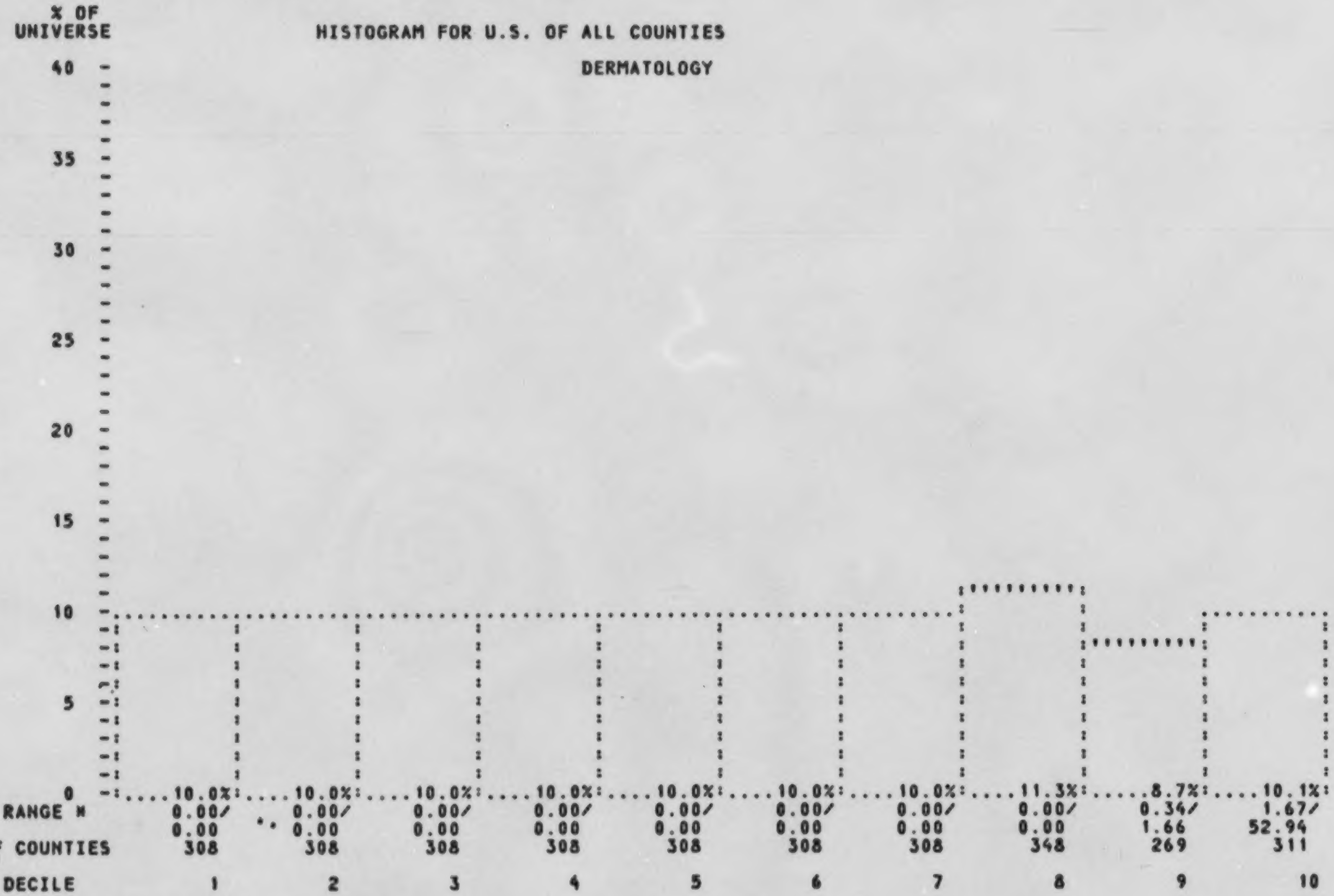
Figure 10



HISTOGRAM FOR U.S. OF ALL COUNTIES
OTOLARYNGOLOGY

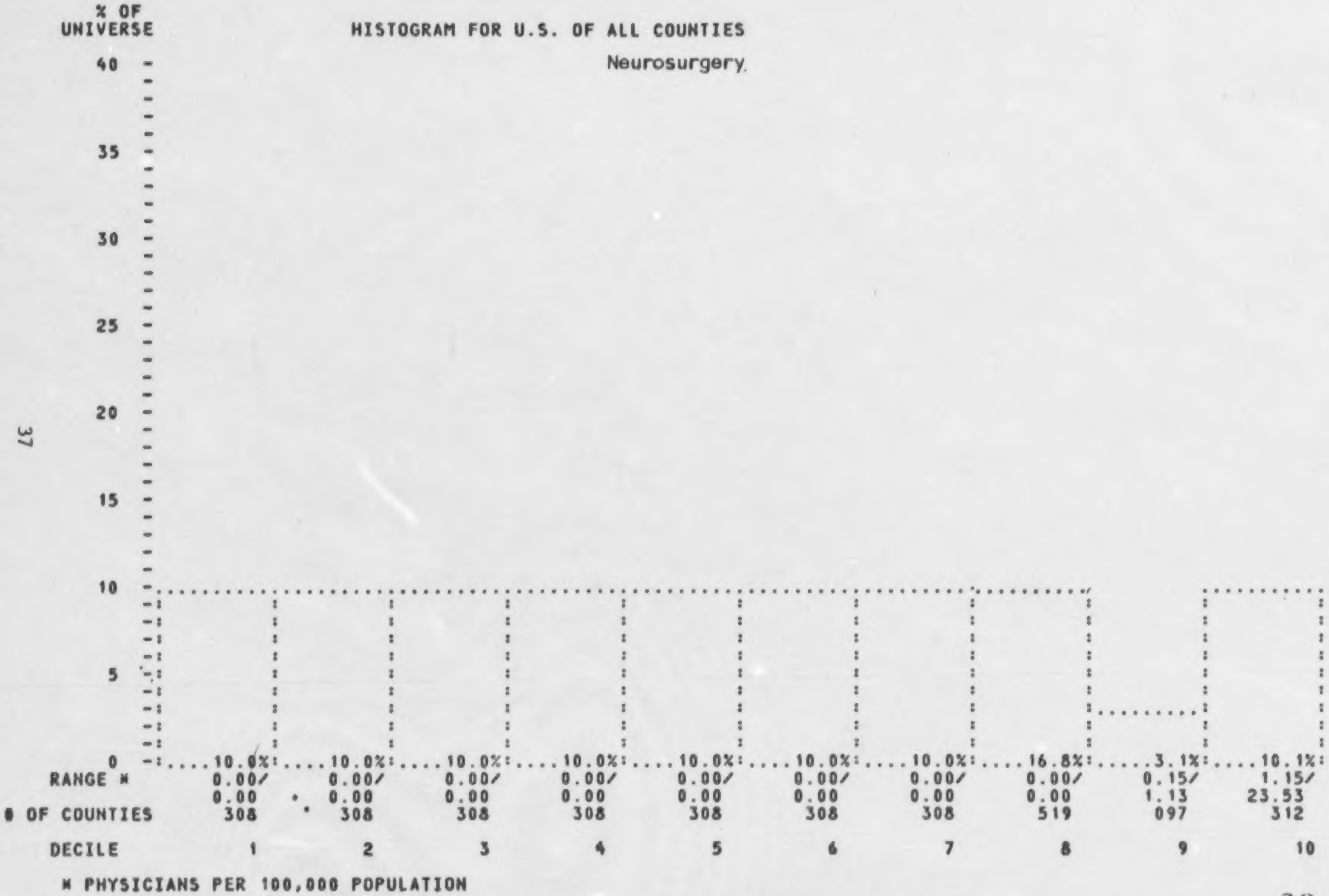
* PHYSICIANS PER 100,000 POPULATION

Figure 11



* PHYSICIANS PER 100,000 POPULATION

Figure 12

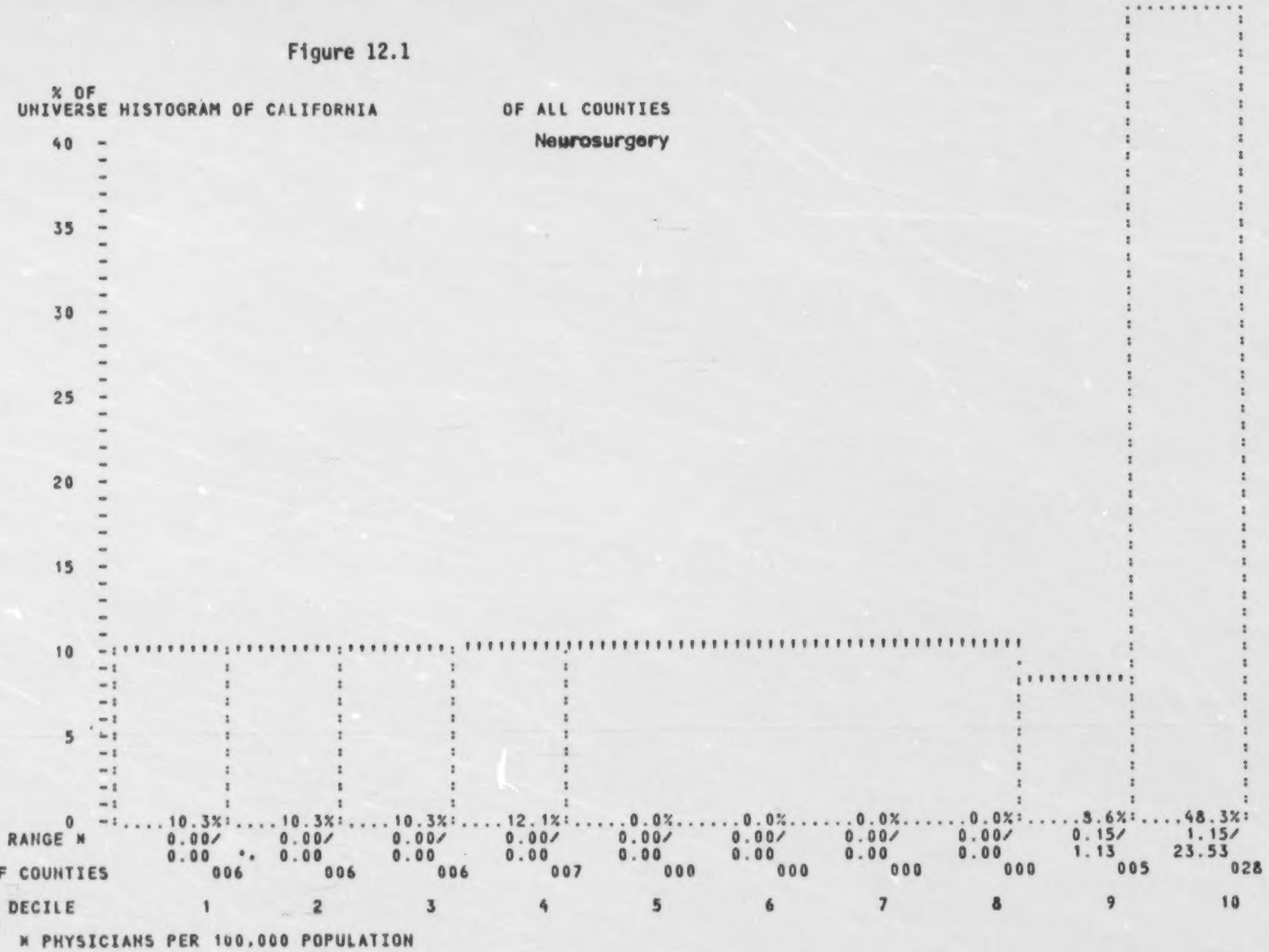


HISTOGRAM FOR U.S. OF ALL COUNTIES

Neurosurgery

* PHYSICIANS PER 100,000 POPULATION

Figure 12.1



38

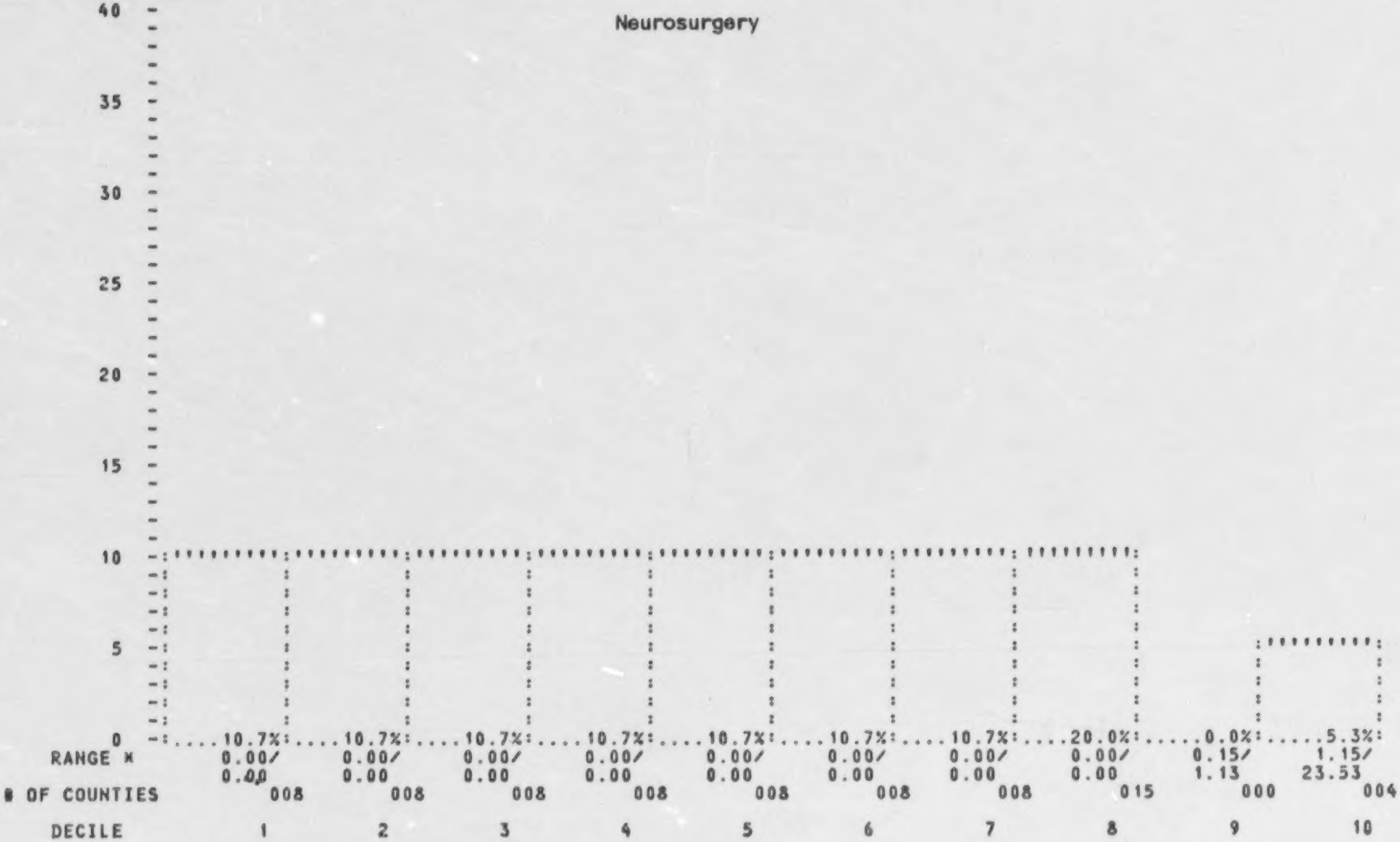
71

66 70

Figure 12.2

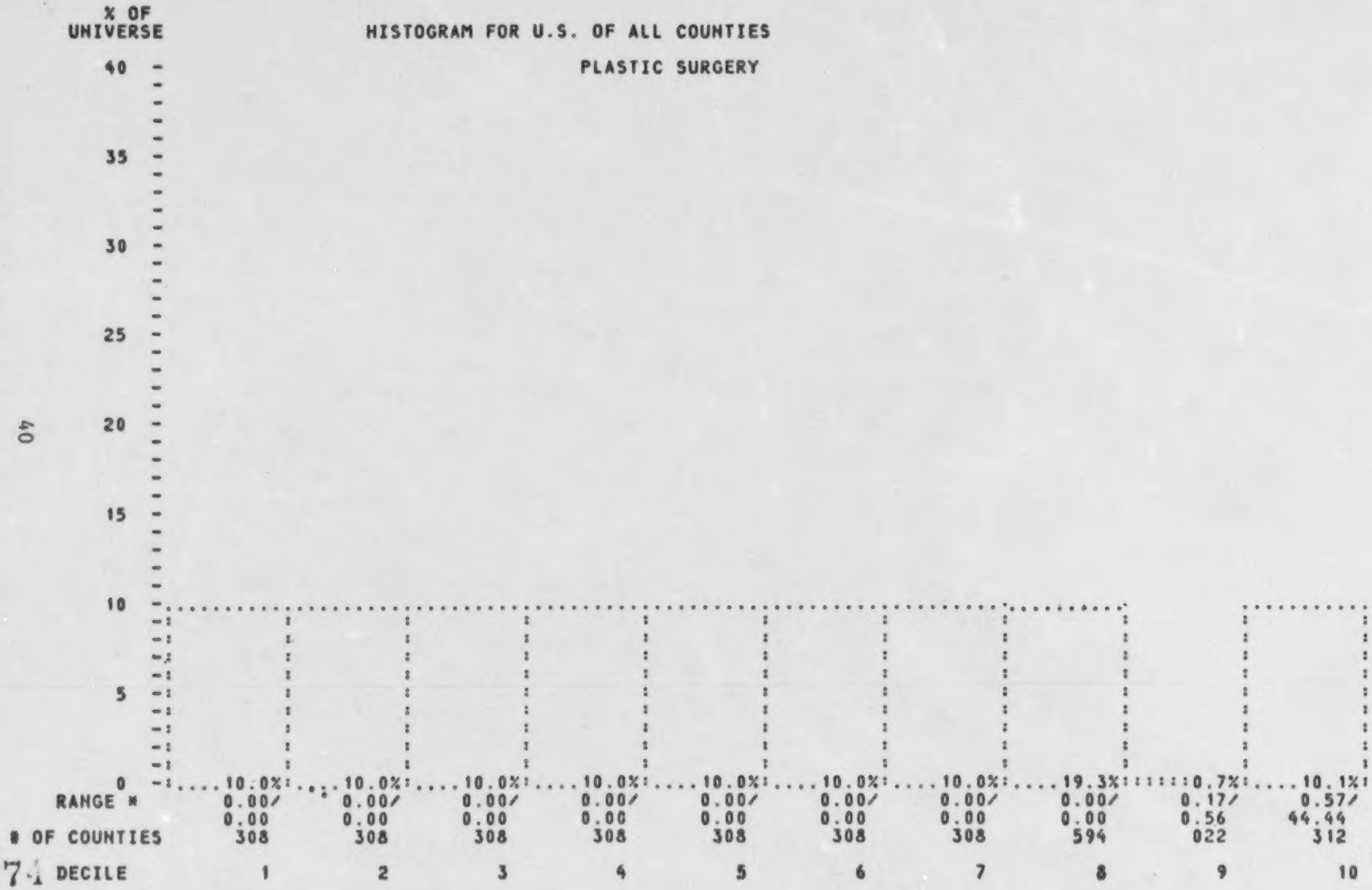
% OF UNIVERSE HISTOGRAM OF ARKANSAS OF ALL COUNTIES

Neurosurgery



* PHYSICIANS PER 100,000 POPULATION

Figure 13



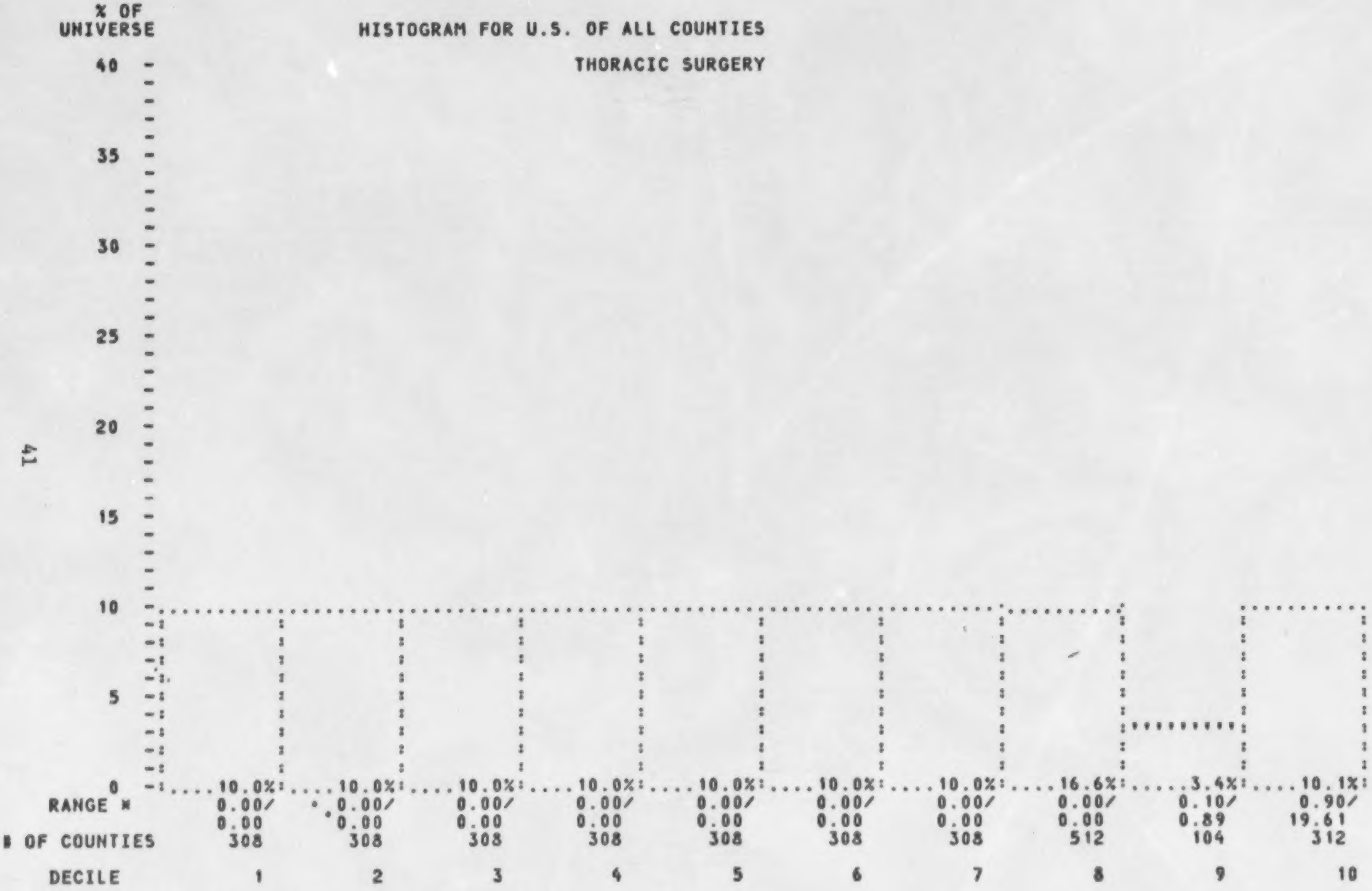
HISTOGRAM FOR U.S. OF ALL COUNTIES
PLASTIC SURGERY

* PHYSICIANS PER 100,000 POPULATION

Figure 14

HISTOGRAM FOR U.S. OF ALL COUNTIES

THORACIC SURGERY



* PHYSICIANS PER 100,000 POPULATION

LITERATURE REVIEW OF REASONS FOR VARIATIONS IN DISTRIBUTION

The second part of Charge 1, provided in this section, is a synopsis of the current literature on physician distribution. An extensive appendix, Appendix 4, contains a review of 90 factors found to be related to physician location including influences on and objectives of physicians as well as environmental, practice-related and demand-related decision factors. Many of these factors are found to be closely interrelated, as well as overlapping. There are conceptual differences found in the studies, and it is difficult to separate each factor into a discrete influence.

The Problem

The Secretary of The Department of Health, Education, and Welfare, in an address to the Association of American Medical Colleges in October 1978, stated that the geographic maldistribution of physicians is one of two basic concerns in national health policy (Califano, 1978). More recently, Dr. David Rogers, President of the Robert Wood Johnson Foundation, reported that while there will not be an overall shortage of physicians providing general medical care in the 1990s, serious inequities still exist in the availability of care (Rogers, 1979). Other authors cite similar findings (Bobula and Goodman, 1979).

Influences: Background Factors

Several categories of influences have been reported to affect location decisions. These include the geographic background of the physician, such as place of residency, or some combination of geographic origin, medical school, internship, and residency location. A recent study found that National Health Service Corps (NHSC) physicians who eventually locate in rural areas and those who locate in urban areas are not differentiable in terms of background (Wilson, 1979). The study found, however, that physicians who entered practice in non-NHSC rural areas usually attended medical schools located in a relatively small community, had residency experience in a nonhospital setting and/or in a rural area, and had a rural background (Wilson, 1979). Even though a physician may decide to practice in a rural community, this is not sufficient to compel the continuation of practice in that community (Parker and Sorenson, 1979). The research results are not definitive on long-term retention in rural or shortage areas.

Objectives

Physicians' choices are not only affected by their sociodemographic characteristics and origin, but individually they have a number of personal objectives regarding their life-styles. Both the physician and spouse have a set of preferences with respect to careers and place of residence, which includes the role of other individuals. These preferences or goals can be primarily family-oriented, economic, prestige-oriented, or professional.

Professional goals/preferences can include:

-- Accessible hospital facilities
-- Avoidance of long hours of practice/excessive workload
-- Contact with colleagues/professional interaction

Personal goals can include:

-- Spouse/family/friends--influence of/desire to locate near
-- Time for leisure/family pursuits
-- Climate or geographic area preferences
-- Community/school preference

The Government Accounting Office (GAO) found rural physicians generally more influenced by personal and community factors and urban physicians more influenced by factors related to the practice of medicine. Hassinger (1979) found that when rural physicians characterized the salient differences between urban and rural practice, they emphasized the quality of patient-physician interaction, while urban physicians cited lack of facilities and support personnel. These conclusions are borne out by Wilson's data which indicated that students from rural areas, who are not interested in research or teaching, are more likely to locate in rural areas.

Decision Factors

The decision factors which a physician considers in practice location choices can be numerous, but basically involve: (1) the environment of the area; (2) the type of practice he/she will be able to pursue; and (3) the perception of demand and need for services in an area (Kane et al, 1979). Although these may each impinge on location choice, they are not necessarily decisive in all cases. It is clear that the communities with the fewest resources will have the greatest difficulty attracting providers. Surveys of physicians indicate that community characteristics such as cultural and recreational opportunities, climate, the quality of the educational systems, and the wealth of an area may play a predominant role in the decision making process. In general, climate and geographic preferences appear to be strong motivating factors, as are preferences for leisure activities. However, it should be noted that these factors are not very amenable to policy manipulation. It should also be noted that anecdotal information from physicians about an area (need, demand, income) can play an important, although undocumented, role in the decision-making process.

Some studies strongly suggest that one of the factors necessary for retaining physicians in rural areas is good professional support. Professional considerations that often figure prominently in a physician's choice of practice location include the availability of clinical and/or hospital facilities, the opportunity for contact with other physicians, and the possibility of continuing education.

Considerable attention has been devoted to the influence of economic factors on physician distribution. Research to date has not shown a strong correlation between economic factors and specialty or location choice. Both fees and incomes vary considerably by urban-rural area, region, and State. Except for Canadian studies, research relating physician location, or geographic distribution, to income differences has not shown a strong relationship. This may be due to: (1) Social taboos against citing income as a motivation factor; (2) the lack of good data; or (3) the intercorrelation of the variables and inability to separate out factors. It is possible that physicians do take fee levels into account in making location decisions (Institute of Medicine, 1979), but the available evidence presents no firm conclusions.

A number of factors are important in affecting the demand (or perceived need) for health services: These include population size, age (population 65 and over), income of the population; education (affecting utilization), physician income, and the existence of Federal programs. Most research has dealt with population size, per capita income, and physician income. Results show the migration of physicians to well-populated areas with high per capita incomes.

Summary

There are a number of factors in the literature relating to location choice, and it is difficult to weigh the importance of each. The relative importance of professional, sociodemographic, lifestyle, personal, community, and demand-related factors has not been determined, so that it is difficult to sort out where policy applications should be directed.

Each of the studies is conceptualized differently. Some are surveys of an individual physician's performance; others are market studies, or regression analyses of sociodemographic data. No two location models are methodologically comparable. Differences in specification, estimation procedures, and data contribute to differences in the results obtained.

RECOMMENDATIONS

RECOMMENDATION 12: Incomplete information exists on the direction of causation of many of the factors affecting physicians location. Additional research is recommended to study: (1) How background factors such as sociodemographic factors affect specialty and location choices and the interaction between specialty and location choices, and (2) what factors affect permanent location choices in underserved/rural areas.

RECOMMENDATION 13: Since the role of economic factors in location choice is not clear, attempts should be made to improve methodologies to determine this role and to gather data on previously nonquantifiable topics such as income as a motivating force in specialty or location choices.

RECOMMENDATION 14: Those strategies which GMENAC has deemed most promising, such as preceptorships and tax incentives, and those which are most amenable to evaluation efforts, should be evaluated more vigorously.

IV. VARIATIONS IN POPULATION-BASED USE RATES AND EXPENDITURES: IMPLICATIONS FOR MANPOWER POLICY

Charge #2--Describe the variations in per capita expenditures for and rates of medical/surgical services among selected communities; relate these variations to local physician distribution and project the implications for future manpower needs.

Charge #3--Given that local physician supply will always vary, what criteria can be used to indicate acceptable levels of variations in local physician supply, per capita rates of medical and surgical use, and per capita expenditures for medical services?

Since a major goal of physician manpower policy is to equalize the distribution of medical services on a geographic basis throughout the country, it is extremely important to examine the relationship between local service use rates and physician supply. Current manpower policy, which uses physician-to-population ratios as the primary measure of supply adequacy, assumes a simple relationship between local physician availability and the amount and kind of medical services consumed locally. A number of studies provide evidence that the physician supply/service distribution relationship is a complex one, but one that can and should be factored into policy decisions on the geographic distribution of physicians. (See Wennberg et. al., in press.)

A review of the literature revealed that variations in the amount and kinds of medical services used by residents of different geographic areas in this country and Canada are dramatic. In general, the smaller the geographic units that are being compared, the greater the variations in their resident's use rates for medical services. Utilization variations did not reflect statistical artifacts nor differences among population groups studied. While most of the studies of variations in specific procedure rates concentrate on surgical services, there is evidence that variations in nonsurgical service rates are at least as great as those for surgical procedures. In most studies there is a correlation between the rates of use of specific procedures and the local availability of medical specialists who perform these procedures.

However, these correlations do not allow accurate prediction of specific procedures rates based on the local distribution of physician specialists. Even in communities whose residents experience the same overall rate of surgery, specific procedure rates vary dramatically.

Specifying acceptable levels of variation involves choosing among ranges of possible ways of practicing medicine. In making the choice, the objective information necessary to specify an optimal pattern of consumption of medical care is not available. The choice must be made under uncertainty because information on the outcomes of alternative ways of treating a specific condition is commonly not available. Consequently, an optimum treatment configuration cannot be specified and the physician manpower "needed" cannot be specified in terms of outcome objectives. Furthermore, under circumstances when information on outcome is available, there is some evidence that patient choice of treatment may differ substantially from the choices physicians make for their patients (McNeil et al., 1978). Under this circumstance, "need" assessment based on physician preference would likely produce a different specification for physician supply than would "need" assessment based on patient preference.

The absence of an optimal solution to the question of acceptable criteria poses a significant challenge to current methods for estimating manpower requirements based on professionally defined needs. These methods assume that current national average utilization rates represent a first approximation for projecting manpower requirements. However, the national average rates result from the weighted average of per capita rates in local markets whose rates vary extensively. The crucial question is: "Which rate is right?" Unfortunately no clear answer is available.

In assessing the various patterns of medical practice, it is recommended that particular attention be paid to those costs and benefits that can be clearly identified. The empirical data indicate that current supplies of specialty physician manpower in low rate fee-for-service areas in New England (and in Health Maintenance Organizations (HMOs)) meet the demand for low variation services and that the surplus labor is invested in high variation workloads, as will be described. Higher rates of use of higher variation services implies greater per capita costs, and, particularly for invasive care such as elective surgery, higher rates of mortality and morbidity. Whether the risk is worth the benefit remains moot because the longer range benefits of alternative approaches are not clear. Drs. Wennberg, Lapenas, and Greene argue that identified risks and costs should be given more weight than uncertain benefits and that specialty manpower requirements based on a choice to minimize costs and morbidity and mortality are reasonable and consistent with what can currently be known about the public welfare.

As an example of the extent to which national requirements for physician manpower will vary depending on the level of use of services which is adopted as the normative rate, the authors estimated the numbers of physicians required in 1990 to accomplish surgical workloads under alternative estimates of the preferred workloads. The estimates are based on the extrapolation from low and high surgery rates among the ten hospital service areas with the largest populations in Rhode Island, Maine, and Vermont; the extrapolation is to the United States population in 1990, using the same estimate for 1990 as was used in the GMENAC methodology.

The results of the estimation are summarized in Table 4. If the low rate of use of the operations is the norm for the planning of surgical manpower, the number of surgeons required for the seven surgical specialties* listed is 17,762. This number is 41% fewer than the number estimated as needed by the GMENAC panels. If the high rates were taken as the target for projecting manpower requirements, then 37,824 surgeons would be needed to meet the required workload. This estimate is 26 percent higher than the estimate made by the GMENAC modeling panel.

Table 4 gives the ratio of the estimates for each of the listed specialties to the GMENAC requirement. For most specialties, the range of rates of use of services produce manpower need estimates that bracket the GMENAC estimate. However, for ophthalmology services and particularly for plastic surgery, the rates of use of service in most areas in the New England study are substantially below the rate on which the GMENAC need estimate is based. The implication is that for each of the listed specialties, there are a number of areas in New England for which GMENAC estimates represent an overestimation of the number of needed physicians.

Details concerning the methodology used for making the estimates together with tables giving the range of utilization and manpower requirements for specific procedures are given in the complete paper, to be published in 1980 as a background paper of the Geographic Panel.

Necessary vs. High Variation Care

Drs. Wennberg, Lapenas, and Greene reviewed the epidemiologic data comparing the distribution of services among relatively homogeneous populations served by different medical care organizations, including fee-for-service, HMO, and the National Health Service in the United Kingdom. The analysis demonstrates that some condition/procedure combinations--for example, operations for cancer, hernias, certain types of neurosurgery, hospitalizations for hip fractures--show little variation between populations, and the pattern of distribution of these services is compatible with a model in which "need" is met more or less uniformly throughout all markets. By contrast, most conditions or condition/procedure combinations are hospitalized at strikingly different rates and the distribution suggests that there is considerable discretion with regard to the decision concerning the "need" for the procedure.

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* As listed in Battelle Document dated February, 1980 and in the estimates for gynecologists from the second draft entitled "OB/GYN Delphi Panel Responses for Manpower Requirements."

Table 4

1990 U.S. MANPOWER REQUIREMENTS FOR SEVEN SURGICAL SPECIALTIES (SURGICAL CARE COMPONENT ONLY) COMPARISON OF REQUIREMENTS BASED ON GMENAC'S ESTIMATES AND ON NEW ENGLAND'S [a] OBSERVED UTILIZATION EXPERIENCES IN LOW AND HIGH USE AREAS

SPECIALTY	BASED ON GMENAC'S ESTIMATE	BASED ON NEW ENGLAND[a] UTILIZATION EXPERIENCES			
		Low	Ratio to GMENAC	High	Ratio to GMENAC
General Surgery	8,422	6,019	.71	11,005	1.31
Obstetrics/Gynecology	11,334	5,705	.50	15,118	1.34
Ophthalmology	840	394	.47	872	1.04
Orthopedic Surgery	4,126	2,290	.56	4,921	1.19
Otolaryngology	1,532	1,126	.73	2,449	1.60
Plastic Surgery	1,548	602	.39	938	0.61
Urology	2,156	1,626	.75	2,521	1.17
TOTAL PHYSICIANS	29,958	17,762	.59	37,824	1.26

a) For the 10 largest hospital service areas in the 3-state area of Maine, Rhode Island and Vermont, rates for surgical procedures by specialty for a 3-year period were obtained. Populations in the 10 areas ranged from 62,595 to 179,596. For each procedure category, rates in the high and low area were used to estimate the manpower requirements, using the assumptions concerning productivity made by GMENAC's Requirements Model. Detailed computations are available in GMENAC Paper, "Variations in Population-Based Use Rates and Expenditures: Implications for Manpower Policy" by John Wennberg, Coralea Lapenas, Richard Greene, and Michael Zubkoff.

The consistency of the indicators of variation among different sets of populations, together with the fact that patterns of variation between procedures can be so different, suggests that the relative ranking of a procedure along the high to low variation scale fixes that procedure along a continuum descriptive of discretion in clinical decision making. Along the continuum, low variation procedures are those for which (1) the condition to be treated is well defined as to its presence or non-presence and (2) there is consensus concerning the value of the procedure (as distinct from an alternative approach) in treating the condition.

By contrast, high variation procedures are: (1) those in which "need" is less clear, certainly not a dichotomous (yes or no) situation, and/or (2) those about which people do not agree concerning their efficacy.

The argument is made that at current levels of supply, variations are restricted to those conditions for which there is little agreement on what treatment should be used, given the general relationship between specialty manpower supply and specialty-specific workload rates. Planning decisions to specify requirements for specialists in effect are decisions on what is the appropriate level of services for high variation procedures.

Variations in Rate of Surgery Among Non-Fee-For-Service Systems

Within western nations, procedure-specific patterns of variation appear to be similar even though the way health services are organized and financed may differ. In the United States, patterns of procedure rate variation among HMOs appear to be similar to those seen under fee-for-service systems. Luft, who has studied surgical services among HMOs, found the overall surgery rates to be consistently lower than under fee-for-service (Luft, 1978). However, the specific procedures demonstrated considerable variation among the HMOs studied.

On the Causes for Variation in Rate of Services

Drs. Wennberg, Greene, and their colleagues reviewed the crucial importance of the physician as a producer of variations in rates of service use. In addition to the aggregate supply, the evidence points to the importance of differences in physician decision-making which are attributed to uncertainty concerning the outcome of various methods for treating a particular condition (e.g., surgical or nonsurgical treatment of gallstones) and to differences in values physicians attribute to various modalities of treatment. They amplify the two points made earlier regarding: (1) Professional uncertainty, and (2) failure of the physician agency role to guarantee that patient rather than physician preferences dominate the decision to use a particular modality of care.

Professional Uncertainty as a Source of Variation

The interpretation that variations reflect differences in professional judgments made under uncertainty concerning the existence of disease or the value of specific treatments is supported by the medical literature. The extensive literature concerning the variability of physicians as observer and interpreters of medical evidence has been reviewed by Koran (1975).

The uncertainty concerning diagnostic or therapeutic decisions that exist in the medical literature are reflected in the decisions that are measured by the small area techniques reported here.

The Flawed Agency Role as a Source of Variation

The importance of physician choice in influencing utilization is not restricted to cases of uncertainty about diagnosis or long-range benefits. It involves the values he or she assumes to be those of the patient.

The divergence between physician values and patient values--and the fact that the former can dominate decision making--is shown by examining the choices patients would make if they were better informed about the alternatives when the outcomes are known or where there is the risk of death when using alternative choices. Here the choice is not under uncertainty but there is the existence of objective information whose utilities (e.g. values) are being expressed in the decision process. A particularly impressive example of the fact that the agency choices physicians make on behalf of their patients can be radically different from the choices patients would make had they been provided more information is given by McNeil and her colleagues (McNeil, et al., 1978). When they asked patients who had already undergone an operation to remove a cancerous lung to assess their preferences for greater certainty for short-term survival vs. greater probability for survival at five years, most patients preferred greater immediate certainty.

Consequently, these patients would have been better served by radiation therapy than by surgery for their cancerous condition. The results thus indicate that patients' preferences for treatment modality can be more conservative than their physicians and McNeil concludes that patients appear to be more adverse to risk than their physicians. The study illustrates the differences that can exist between physician and patient utilities and how, with more information, patients may make choices more consistent with their own values and more divergent from those of their physician-agents.

Conclusions Concerning Preferred Criteria

The HMO experience, the United Kingdom experience, and the low rate fee-for-service market areas seem to provide compelling examples of experiences in which populations receive care with which they are more or less satisfied and which involve lower costs and less morbidity and mortality. Given the higher costs and greater numbers of certain deaths associated with greater use of high variation services, the manpower requirement decision for specialists should be made to minimize the chance of significant Type B errors, which are having too much manpower who create iatrogenic disease and unnecessary costs by intervening with "truly unwanted or ineffective" medical care. A Type A error would be having insufficient manpower to meet true need. The data summarized by Wennberg, Lapenas, and Greene support the notion that there is no evidence for significant underutilization for low variation hospital services, and that much of the current workload is invested in high variation services.

Serious attention should be given to making available to physicians utilization rate experiences relative to other physicians practicing in an area. Experience among 13 Vermont Hospital Service Areas and in the Province of Saskatchewan suggests that feedback of population-based data on incidence of procedures may be a valuable tool for peer review and can affect average rates of procedures in areas (Wennberg et al., 1977; Dyck et al., 1977).

The Significance of Professional Uncertainty: Some Current Public Policy Dilemmas

Surprisingly, little disagreement exists (among western nations) on the social objectives of a public health policy. Across a wide spectrum of political economies, people appear to agree on the basic values that should regulate the character of their national health care systems. A consensus exists that health care is a right of citizenship that should not depend on an individual's social or economic circumstance or on geographic location. This right to health care includes the right to equitable use of "curing" technologies that improve the length and "quality" of life and "caring services" which without pretense of cure, make disabilities more endurable and death more tolerable.

A parallel consensus exists that the "free market" is an inefficient means for achieving agreed-upon social goals. As a result, nations of divergent political ideologies all intervene directly into health care markets. Although their methods differ, the strategies of intervention--those regulatory efforts designed to assure that the social goals are in fact realized--are necessarily based on a model of how the private market works, particularly the causes of and remedies for its failures. Health interventions range from the organization of suppliers into a National Health Service, as has occurred in England, to the regulation of specific, selected elements of the market through rate setting by regulatory and planning agencies, as typified by the United States. Public interventions, at least in western nations, primarily address distribution of resources, access to services, and freedom from untoward financial loss of individuals who use services.

With the qualified exception of certain drug outcome studies, the issue of the effectiveness of allocated services with regard to their "curing" or their "caring" expectations has not been of direct concern to public policy. Nor has the issue of how resources are allocated among competing priorities (for example between "curing" and "caring" efforts or between alternative approaches to either) been of direct concern. The issue of how and when resources designated for use in the health sector are allocated to optimize individual welfare is a responsibility tacitly delegated to the medical profession, to be resolved through the profession's traditions which emphasize science and ethics as a sufficient means for resolving questions of fact and value. This process assumes health resource allocation based on professional consensus concerning the value of technology and the nature of patient need or utility.

Much of the current policy is thus based on the belief that an underlying professional consensus exists on the optimum methods for allocating medical technology. For example, such programs as the Professional Standards Review Organization (PSRO) assume that meaningful consensus exists on which standards of care can be developed that will promote the public health by insuring that only necessary hospitalizations and procedures are undertaken. Similarly, the development of national standards for health resources--physicians per capita and facilities per capita--rests on the assumption that there is a determined relationship between resource input and health care outcomes. Needs-based planning such as the GMENAC approach to manpower planning is an example. However, if the existing evidence is usually insufficient to settle controversies on the value of common medical practices, consensus standards represent weighted averages of those selected to establish them and cannot serve as a basis for the rational allocation of medical care technology. Indeed, without more direct information on the outcomes of alternative approaches, rational allocation is not possible if the criterion for rationality is the maximization of health through the efficient use of health care.

In a similar vein, unless the choices made in resource allocation represent the informed wishes of the patient--rather than the physician--then the same criterion for rationality cannot be met. An important implication of the evidence cited previously is that the limits on informed decision making are more severe than generally realized, affecting physicians as well as their patients. This is a problem even when outcomes are reasonably well-known: McNeil shows that the values reflected by the physician's choice of treatment do not reflect the values of the patient; had the patient known more, he/she would have chosen otherwise. And when the outcomes of alternative treatments are not well understood as is often the case--informed decision making or giving informed consent is difficult indeed.

While most regulatory strategies assume so, it is not clear that health services provide what patients want. At the level at which health care is used in U.S. markets, marginal case selection is discretionary in the very fundamental sense that more care may not necessarily be better or that more intensive care would necessarily be selected were patients fully informed concerning the possible outcomes. For this reason, current regulatory decisions concerned with the equitable distribution of resources or an efficient use of resources need to be re-examined.

The dilemma of regulating "equity" without regard to effectiveness is illustrated by the patterns of income transfer between communities that occur because of taxation or insurance premium policies. At the level of local markets the premiums charged or taxes levied are not closely related to population consumption rates so that low consumption populations commonly pay the same amount as high consumption populations. The cross-population subsidies persist over time, (unrelated to differences in population need) as a function of the distribution of services. If the service paid for by the income transfer were an unequivocal good, then the interpretation would be easy. But a dilemma is clear: Populations that use more health services may not be as well off as those using less; it is not clear how the principles of "equity" can be used to interpret the observed inequalities in per capita expenditures.

Similar uncertainties exist concerning the efficient production of services. Because the outcome value of many common procedures such as tonsillectomies. hysterectomies, or cesarean section is in dispute, traditional ways of evaluating efficiencies based on relative amounts of resources used to produce a treatment are subject to criticism. It is not realistic to evaluate technical efficiency without regard to the efficacy of the product produced. Clearly, it is absurd for regulatory agencies to award institutions for efficiency if they are producing a mix of cases that decrease population welfare; yet this may be precisely what is happening.

Manpower requirements planning, undertaken using either econometric models (e.g. the Bureau of Labor Statistics or the Bureau of Health Professional models) or needs-based models (e.g. the adjusted needs-based GMENAC approach) begin with the assumption that current utilization represents an important first approximation of the optimum situation. In the case of econometric approaches where utilization equals demand, the problem of projection involves estimating the influence such variables as future income will have on consumer demand for care. For needs-based planning, the issue is to what degree current utilization meets "real" need, by which is meant the need that physicians identify after evaluation of patient morbidity. The implication of the previous evidence for the econometric approach is that current utilization does not reflect what would occur if informed consent were the basis for clinical decision making; therefore, current utilization cannot be interpreted to represent an optimum allocation based on consumer market choice. The implication for needs-based planning is that informed choice among treatments based on expected outcomes--even if those outcomes are based on physician, rather than patient values--cannot be systematically applied across the range of treatments currently employed in the common practices of medicine.

Primary Care Physicians Manpower Requirements

Most of the Panel's discussions were concerned with the need for specialists, a perspective due largely to the fact that the empirical analyses on which the main arguments are based concern the use of hospitals. Some information is available on the implications of various choices for primary physicians, including the possible consequences of differences in distribution between the alternative models for primary care delivery, namely the per capita numbers of internists and family practitioners.

Briefly, Vermont data show that population areas with more internists per capita have greater numbers of diagnostic tests, more re-visits per capita and may experience greater difficulty in achieving access to physicians for new episodes of illness than do areas with greater numbers of general practitioners per capita. The experiences seem to be explained by the fact that internists are more accustomed to detailed workups, are more likely to see patients for follow-up and have full schedules which are not designed for drop-in patients. The contrasting data for general practitioners are based largely on the "old" general practitioner (GP) model rather than family practice and the workload profiles of this newly emerging professional subgroup have not been studied. If they emulate the GP, then greater emphasis on the family practitioner model should improve access to care and minimize re-visits. Based on existing information, the impact of either approach on population health cannot be assessed.

What criteria should be used to develop estimates of primary physician manpower? Under the assumption that they do not undertake invasive technology, the arguments developed for making value judgments concerning specialists supply requirements do not apply to primary physicians, leading to the conclusion that the targeted proportion of primary physicians should be considerably larger than the 55 percent of all physicians that now stands as a national average. This reason is primarily a "negative" one--because the number of specialists should be reduced, and the existing supply must be shifted into primary care avenues. In the longer run, better estimates of the work of primary physicians should be made based on a more systematic analysis of rates of initial contacts and revisit rates.

RECOMMENDATIONS

RECOMMENDATION 3: GMENAC urges the use of small area population based data on the availability, requirements for and utilization rates of hospital and physician services as a manpower planning tool.

RECOMMENDATION 4: GMENAC urges that the ranges of variations in the utilization of specific procedures and services among communities and service populations be clearly delineated (including communities with differing financing and organizational arrangements for the delivery of medical services).

RECOMMENDATION 5: Serious attention should be given to making available to physicians their utilization rate experiences relative to the norms of other physicians practicing in their immediate area, region, or in the Nation.

RECOMMENDATION 6: Serious attention should be given to the voluntary collection and dissemination of aggregate statistics for analytical purposes relative to communitywide utilization rates in various service areas.

RECOMMENDATION 7: GMENAC encourages the support of efforts to assess the outcomes of common medical and surgical practices which exhibit high variation across communities, as an important step for establishing the long-range requirements for suppliers of medical services in the United States.

RECOMMENDATION 8: Future health manpower planning groups should compare manpower estimates (whether derived as a "needs-based," "demand-based" or "requirements-based" model) against empirical estimates selected from areas in the United States which exhibit high and low utilization patterns.

V. CRITERIA FOR EQUITY AND ACCESS: PHYSICIAN-TO-POPULATION RATIOS AND TRAVEL/TIME DISTANCE TO SERVICE

INTRODUCTION

Because of the complexity and scope of physician distribution issues, it has not been possible to measure accurately the geographic maldistribution of physician services. Numerous studies have been concerned with documenting the extent of variation in the distribution of physicians and with the characteristics of this variation. Less attention has been devoted to the development of criteria and standards for defining an optimal or adequate distribution of physician services. While it is acknowledged that the current distribution of physicians by geographic area has resulted in problems of accessibility for some population groups, for example those in some rural areas, no agreement exists concerning the number of physicians which would be required to meet the health care needs of these populations. Further, no consensus exists concerning criteria for determining whether an area has a "shortage" or a "surplus" of available health manpower.

In the development of criteria to determine an equitable distribution of physicians by specialty type, several factors emerge from a host of possible criteria as key factors to consider. These factors, which are found frequently on criteria lists, include relative population need, resource availability, and resource accessibility. Relative population need is often measured through adjustments for differing sociodemographic characteristics and disease incidence from some standard population. Resource availability is sometimes measured through resource-to- population ratios, and geographic accessibility through time-to-service.

Although numerous estimates of ratios of physicians by specialty-to-population exist, relatively few time-to-service requirements have been reported. None are defensible in terms of rigorous methodological documentation, and all suffer from a basic ad hoc, unscientific approach to setting requirements for meeting essential medical needs. Estimates of maximum "acceptable" distances-to-services or travel times-to-services are often based on surveys of what is acceptable to area residents or on consensus estimates of experts or representative groups of area citizens. The standards consequently have little scientific basis in terms of the maximum time to care to prevent serious adverse consequences. It is therefore not possible to staunchly defend or attack a 30 minute driving time, for instance, as opposed to a 20 minute or a 45 minute driving time.

Physician-to-Population Ratios--Caveats

Physician-to-population ratios have frequently been used as a proxy measure of the relative availability of physician services. The basis of the method is the selected ratio of manpower to population. This ratio is multiplied by the population in the area being modeled to provide an estimate of the number of providers "needed" or "required" in the modeled area. The validity of the estimate depends upon the appropriateness of the ratio selected to the target population. In the ratio method it is necessary to assume that the manpower count in the numerator and the population count in the denominator operate in the area being modeled in the same way as in the area from which the ratio is selected. (For example, the same State ratio is not equivalent to the same county ratio.) The method generally assumes that population size explains manpower requirements and consequently ignores important influences which do not operate through population size.

Implicit in this approach is the assumption that evenness of the ratios represents a desired distribution. Consequently, variability in physician population ratios across geographic units of observation has been viewed as evidence of maldistribution and the range of variation in the ratios has been used as an indicator of the extent of maldistribution. But if physicians were to be equally distributed, some physicians, for example those in metropolitan areas and in areas with an older population, would face a larger demand for services than those in rural and more youthfully populated areas. Apart from possible interactions between the supply and demand for services, a so-called equal distribution of physicians could lead to excess capacity in some rural areas and undercapacity in some metropolitan areas, and thus to a maldistribution of physician services.

In order to circumvent some of these pitfalls, the numerator and denominator may be defined and adjusted to relate specifically to the problem and geographic area under study. Many different assumptions and definitions can underlie the determination of the number of a specific specialty of physicians.

The number of physicians (the numerator) might be adjusted to reflect:

-- Federal physicians
-- Foreign medical graduates
-- Activity status
-- Full-time equivalency
-- Availability of nurse practitioners and physician's assistants and task delegation
-- Mix of physicians' specialties
-- Medical care organization and practice setting
-- Physician case load
-- Productivity

The population figure might be adjusted to reflect:

- -- Age, race, and sex structure of population
- -- Income and ability to pay
- -- Disease incidence
- -- Morbidity and presence or prevalence of chronic conditions
- -- Migrant or seasonal populations
- -- Population density
- -- Area geography

As a result ratios may differ widely and cannot always be properly compared.

While the methodology of physician-to-population ratios is slightly more sophisticated than that of either time-to-service or distance-to-service, the resultant area ratios may not be appropriate for modeling manpower requirements in an area. Differences between the area selected for the ratio and the area modeled may exist, and the differences for which explicit allowances have not been made may compromise the validity of the resultant ratio in the area modeled. Since ratios may be premised upon widely differing assumptions and definitions, it is not possible to unequivocally argue that one ratio is superior to another for general use throughout the country as a standard.

Geographic Units of Analysis

An important factor impacting on physician-to-population criteria for assessing equitable distribution of services is the geographical area under consideration. Since the unit of geographic analysis is not specified in optimal physician-to-population ratios, meaningful calculation of the ratios and assessment of the distribution of services and manpower on a small area basis is dependent upon the extent to which the unit of analysis is an appropriate unit to study.

Several types of geographic units of analysis are possible. They include:

State
Health systems agency service area
County
Zip code
Hospital service area
Physician service area
Trade or market areas for commercial products

Historically the availability of basic statistics on geopolitical units has been the primary criterion for selecting a unit of measurement. The widespread use of county data obviously has to do with the relative ease of obtaining information on physicians' practice characteristics and socioeconomic and demographic descriptors of the population. The stability of county boundaries themselves also contributes to ease in analysis. However, consumers seeking physicians' services are not confined to the county, SMSA, or even State of residence in their search for sources of care. Contiguous areas may provide needed resources. In multi-county, multi-State metropolitan areas, there is so much commuting of this nature that State and county lines probably divide rather than encircle health market areas.

Consequently the unit chosen for analysis probably will be grouped or clustered for study. The extent to which medical care services are both available and accessible to the population of a specified geographic locale will depend upon many other factors in addition to natural geographic boundaries. Population density and terrain may influence the application of an optimal or required physician to population ratio through modification based on time- or distance-to-service. Sparsely populated areas may require higher physician-to-population ratios because of unacceptably long driving times as may areas with rugged or mountainous terrains.

Data to support the delineation of health service market areas have not been readily available, however, despite real market areas being the preferred unit of geographic analysis. Given the complex task of defining these areas and the fact that the necessary data are neither available nor accessible on a uniform or a routine basis for almost all areas of the U.S., reliance on administratively designated, albeit arbitrary, geographic boundaries provide an inexpensive, interim alternative to determine service areas. Nonetheless, boundaries which do not reflect market areas are inadequate units of analysis if the relationships among the requirements for physicians' services, the supply of these services, and their utilization are to be elucidated.

The American Academy of Dermatology (AAD) has examined alternative methods of analyzing the geographic distribution of dermatologists. They developed a framework for studying distribution using Zip Code Sectional Areas. The Academy believes these areas to be conceptually superior to States, counties, or federally designated Health Service Areas as geographic units of analysis. Areas formulated to facilitate the collection of census data, those designed for planning hospital facilities, or those defined for political purposes, are very often inappropriate for studying the accessibility of physician care. In addition, it became apparent to the AAD that a single unit was inadequate to deal with all types and levels of physicians' services, as each possesses a unique catchment or service area (Ramsay, et al., 1977).

Zip Code Sectional Areas approximate economic trading areas, in most cases, and thus generally conform to the transportation and communication patterns of each place. It appeared reasonable to the AAD that geographic patterns of health service utilization largely conform to those for goods and services in general. At the very least, Zip Code Areas could be effectively served by a physician specialist at a central location, regardless of existing traffic patterns. Two other specialties--ophthalmology and orthopedic surgery--have also used this approach.

Another approach utilizes the central place theory to compare the economic system and the health care system within a specific geographic setting and demonstrates that consumer patterns for health care services approximate those for goods and services in general (Leyes, 1974). It was concluded that the development of an economic system is a necessary condition for the development of the health system. Using a theory relating the spatial results of supply and demand decisions, Leyes demonstrated that there is a "hierarchical demand structure" such that the amount of and frequency with which consumers purchase goods varies according to the type of goods. Over 500 communities were grouped into seven categories or economic and health-related service areas. It was recommended that these areas be used rather than political or administrative units.

Utilization of physician-to-population ratios along with driving times is another means of analyzing the distribution of services while concomitantly accounting for access and availability. Consequently it is indeed unfortunate that defensible physician-to-population ratios and maximum acceptable driving time criteria do not exist. Nevertheless GMENAC addressed the questions of standards for assessing distribution, fully cognizant that ultimately HSAs and local and State planners will know best their individual needs, factoring in considerations of differences in areas. While the time to service and physician to population standards presented in Table 5 are no more scientific or justifiable than those presented in the following literature review, they are the best possible estimates which the Geographic Distribution Panel could identify for consideration and debate.

Summary Table of Significant Data Items

Table 5 presents the ranges of information available on physician-to-population ratios and times-to-service as well as first cut recommendations of the Geographic Distribution Panel. Two basic premises underlie the development of Table 5.

First, several assumptions were made in defining time-to-service standards. Large variations in the scope of public transportation systems, terrain, climate, and traffic and road conditions were recognized. Mileage figures corresponding to travel times were not estimated for the preceding reasons. A broad range of modes of transportation were acknowledged. Also it was understood that access problems are considerably reduced for those with private transportation, and that the poor, the elderly, and the handicapped are disadvantaged when public transportation must be relied upon.

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Second, the reality that physicians of a defined specialty also perform services outside the unique scope of their specialty was acknowledged. (See Aiken, 1979; Mendenhall, 1978). Because of the possibility of substituting different specialists' services in the treatment of some conditions, five major groupings of physicians are presented. They are: Adult Medical Care Services, Child Care Services, Obstetrical Services, General Surgical Services, and Emergency Medical Services. GMENAC felt that these basic types of health care services should be available and accessible to residents of all areas of the U.S., and that minimum ratios of physicians-to-population in these five basic groupings, as well as maximum times-to-service, for 95 percent of the population should be given.

Table 5 is formatted as follows:

Specialty--The first column provides a way of organizing the specialties under the five major types of care which the Geographic Distribution Panel deemed essential. These types of care seemed intuitively to cover the range of basic services which should be provided.

U.S. Ratio per 100,000--As described in detail in Part III of this report, these data are 1975 FTE figures per 100,000 total population obtained from special computer runs. The figures marked (*) were not available on the special computer runs and were obtained from head count numbers of physicians by specialty in the U.S.

Range of Physician Specialty Requirements Expressed as Ratios of Physicians per 100,000--According to a review of over 200 articles conducted by Applied Management Sciences and reported in Review of Health Manpower Population Requirements Standards, (1976), these are the highest and lowest ratios of physician specialty requirements found in a review of the literature. The ratios represent a broad spectrum of studies from those attempting to provide sufficient resources to treat all medical needs to those reporting observed staffing patterns in HMOs.

GMENAC Modeling Panel Adjusted Needs-Based Ratio of Physicians by Specialty per 100,000--These are estimates of the Delphi groups, and have been approved by GMENAC. These are final estimates.

Recommended Geographic Area of Analysis (Real Market)--As discussed in Part III and recommendation 1., it is absolutely necessary that physician services be analyzed at the medical market level on empirically defined medical market service areas. (See Wennberg et al., 1980; Leyes, 1974; Ramsay, 1976.)

Minimum Acceptable Ratio for All Areas--The figures represents one-half of the ratio of specialists-to-population in the U.S. which the GMENAC Modeling Panel deemed acceptable for 1990. For example, if the Modeling Panel recommends 8.4 pediatricians per 100,000 for 1990, the Geographic Panel would recommend 4.2 per 100,000 as the minimum acceptable ratio.

Table 5
SUMMARY TABLE OF SIGNIFICANT DATA ITEMS

	1975 U.S. Ratio Per 100,000	Range of Physician Specialty Requirements Expressed as Ratios of Physician per 100,000 Pop.	GMENAC Modeling Panel Adjusted Needs Based Range of Ratios of Physicians by Specialty per 100,000 for 1990	Recommended Geographic Area of Analysis (Real Market)	Interim Geographic Area of Analysis	Minimum Acceptable Ratio for All Areas 1/	Range of Times-to Service/ Manpower	Recommended Times-to Service/ Manpower
Emergency Medical Services	1.4-4.7 2/	N.A.	5.3-5.7	EMS Region	N.A.	2.7-2.9	5-30 Min.	30 Min.
Obstetrical Services (OB/GYN)	19.4*	2.6-12.2	18.4-20.0*	Hospital Service Area	HSA Service Area	9.2-10.0*	30 Min. - 1 Hour	45 Min.
Child Care Svs/ Pediatric Medical Care	32.9***	5.5-23.2	47.1-51.2**	Physician Service Area	HSA Service Area	23.6-25.6**	30 Min. - 1 Hour	30 Min.
Adult Medical Care (FP/GP/Internal Medicine)	23.2 (FP/GP) 22.7 (IM)	50 -133.0 3.3-50.0	26.7-30.8 (IM) 33.2-35.7 (FP/GP)	Physician Service Area	County	13.4-15.4 (IM) 16.6-17.9 (FP/GP)	20 Min. - 1 Hour	30 Min.
Surgical Care General Surgery	14.8	1.7-12.4	9.4- 9.8	Hospital Service Area	HSA Service Area	4.7-4.9	30 Min. - 2 Hours	90 Min.

1/ One-half of GMENAC Modeling Panel needs-based estimate.
2/ Range of ratios from AMA, DHHS and Am. College of Emerg. Phys. (1978-80)
* Per 100,000 women of all ages
** Per 100,000 children under 17
*** Per 100,000 children under 16

Range of Times-to-Service--These figures represent the range of times reflected in the literature for each of the five major types of care. Some types such as adult medical care are documented more fully than others. The five types of care were arranged so that the type requiring the shortest time-to-service was listed first.

Recommended Times-to-Service--The Geographic Distribution Panel recommended these as maximum travel times for 95 percent of the population, recognizing that unusual circumstances may arise which make these travel times impossible to achieve for all areas. The recommendations are based on an extensive review of the literature, including consensus judgments of experts and health officials. The Geographic Panel members then reached their own consensus on these data.

PHYSICIAN-TO-POPULATION RATIOS

The literature on physician-to-population ratios is rich in numbers and types of studies reported. The findings of two major papers which summarize ratios found in the literature are presented. The first is a GMENAC Staff Paper on physician manpower requirements which examined physician-to-population ratios for 19 specialties (1978). The paper reports wide ranges for individual specialties, with internal medicine exhibiting almost a 20-fold variation compared to neurosurgery which exhibits less than a 2-fold variation. Table 6 summarizes these findings.

Applied Management Sciences under contract with the Bureau of Health Professions examined ratios for 25 physician specialties. This second major study compared the wide range of ratios by grouping the ratios found in the survey of 200 plus articles in the literature according to the basis for the recommended estimate. Four groupings or clusters of ratios were developed. The first related to treatment of all medical needs, as determined by disease prevalence and morbidity data. The other three categories deal with requirements for analysis of the demand for care, as derived from the opinions of health professionals; "effort analysis" calculations of service requirements and manpower productivity; and observed staffing patterns in prepaid group practice (HMO) settings.

Furthermore, the factors each ratio takes into account are important for proper interpretation and are listed for each study reported.

Morbidity/Demand-Related Factors

- Prevalence of disease conditions
- Consideration of selected disease conditions
- Backlog of untreated conditions
- Requirements for preventive care

Table 6

RANGE OF PHYSICIAN SPECIALTY REQUIREMENTS EXPRESSED AS RATIOS OF PHYSICIANS PER 100,00 POPULATION

SPECIALTY	LOW	HIGH
Primary Care		
General and Family Practice	11.5	55.0
Internal Medicine	5.0	96.0
Pediatrics	4.0	37.0
Medical Specialties		
Allergy	2.0	4.0
Cardiology	1.0	6.0
Dermatology	2.0	6.0
Surgical Specialties		
General Surgery	8.0	15.2
Neurosurgery	0.9	1.4
Ophthalmology	0.5	5.8
Orthopedic Surgery	1.0	6.3
Otolaryngology	1.0	23.0
Plastic Surgery	0.6	2.2
Thoracic Surgery	0.5	1.1
Urology	1.0	5.0
Other Specialties		
Anesthsiology	2.0	12.0
Neurology	1.0	5.0
Pathology	1.0	6.9
Psychiatry	2.0	54.4
Radiology	3.0	13.0

Source: Review of Health Manpower Population Projections, DHEW Publication No. (HRA) 77-22, October 1976.

From: Physician Manpower Requirements, DHEW Publication No. (HRA) 78-10.

- -- Quality of care
- -- Changing definitions of health
- -- Utilization rates (visits per week or year)

Supply/Productivity-Related Factors

- -- Time required to produce services or visits
- -- Case loads per health professional
- -- Technological advances
- -- Task delegation

Delivery System-Related Factors

- -- Organization
- -- Setting
- -- Role definition of health professionals (e.g., primary and specialty care functions)

Other Factors

- -- Patient subpopulations
- -- Reimbursement mechanism
- -- Ability to pay
- -- Urban/rural location

Type of Evidence on Factors

- -- Observations of actual conditions
- -- Test or survey results
- -- Single source judgement

Table 7 summarizes the range of requirements ratios for 21 physician specialties and displays the wide ranges that exist for individual specialties. Psychiatry, for example, exhibits a 26-fold variation while neurosurgery exhibits a two-fold variation. Ratios of primary care physicians show less than a three-fold variation and pediatrics less than a five-fold variation. In almost every case the professional judgement ratios were higher than the needs-based or demand/productivity-based or HMO-based ratios.

The four specialties of general/family practice, general surgery, internal medicine, and obstetrics-gynecology were omitted from the summary table and are presented in Table 8. General/Family Practice ratios of population to physician range from 2000 persons per practitioner under a professional judgement-based ratio to 30,000 persons per practitioner in an HMO setting. General surgeon ratios vary almost six-fold from 8,056 to 58,824 persons per general surgeon. The range of internal medicine ratios is 1,042 persons per internist under a needs-based model to 20,000 persons per internist under a professional judgement based ratio. Finally, obstetrics-gynecology ratios range from 8,190 to 38,402 persons per obstetrics-gynecology under different HMO ratios.

From the host of possible ratios, several federally adopted ratios exist to determine areas with a defined shortage of physician services. In other words, these are accepted minimum ratios to trigger Government action and do not necessarily reflect the lowest "acceptable" physician-to-population ratio. Further, the ratios adopted for Federal use were adapted from ratios in the literature, and carry with them many of the caveats detailed earlier.

In the proposed National Guidelines for Health Planning (P.L. 93-641, 1979) is the following goal statement for primary care: "The supply of primary care health personnel in a community should be no less than the equivalent of one physician per 2,000 population. This ratio can be achieved by fostering the use of nurse practitioners and physician's assistants." This sets forth a goal of a "minimum acceptable" ratio for primary care health personnel. A primary care physician for the purposes of this goal has been defined to include general practitioners, family practitioners, internists, obstetrician-gynecologists, and pediatricians.

In response to the Health Professions Educational Assistance Act of 1976 (P.L. 94-484), criteria for the designation of Health Manpower Shortage Areas were established. Either geographic areas or population groups could be designated shortage areas for several types of health manpower classifications. Central to the criteria is the population-to-manpower ratio. For designation, the area must have a population-to-primary care physician ratio of at least 3,500 population per physician. The population count may be adjusted to reflect the area's age-sex composition and transient, seasonal tourist, and migrant populations. The physician count of non-Federal physicians practicing general or family practice, general internal medicine, general pediatrics, and obstetrics-gynecology may be adjusted for area interns and residents, foreign medical graduates, full-time equivalents of semiretired physicians, restricted practices, and the contribution of nurse practitioners and physician's assistants. In addition the unusually high needs for primary care services, the capacity of existing providers, and the resources of contiguous areas are considered.

The physician-to-population ratio has been a commonly accepted method of defining physician manpower shortage areas since the passage of the Health Professions Educational Assistance Act of 1965 (P.L. 89-290). The ratio has been progressively refined since 1965 to reflect more accurately the physician resources available to the population. Unfortunately the federally adopted criteria and standards cannot respond to the question of "what should be," and they present only a step toward defining a minimum acceptable accessibility to services.

Table 7

SUMMARY TABLE: RANGE OF SELECTED "REQUIREMENTS RATIOS" BY OCCUPATION

	Need Based Ratio		Professional Judgement Based Ratio		Demand/Productivity Based Ratio		HMO Based Ratio	
	Pop. per Professional	Professional per 100,000 Pop.	Pop. per Professional	Professional per 100,000 Pop.	Pop. per Professional	Professional per 100,000 Pop.	Pop. per Professional	Professional per 100,000 Pop.
ALL MDs	596	167.8	534-724	138.1-187.3	547-989	101.1-182.8	651-1,493	67.0-153.6
Primary Care	752-1,585	63.1-33.0	1,264	79.1	2,000	50.0	1,177-1,739	57.5-85.0
Allergy			25,000	4.0			40,000-250,000	0.4-2.5
Anesthesiology			8,457-14,000	7.1-11.8	10,764-17,544	5.7-9.3	25,641-55,556	1.8-3.9
Cardiology			25,000-77,000	1.3-4.0				
Dermatology			40,000-50,000	2.0-2.5			32,258-333,333	0.3-3.1
Gastroenterology			50,000	2.5				
Neurology			60,000-77,000	1.3-1.7			107,000-125,000	0.8-0.9
Neurosurgery			77,000-125,000	0.8-1.3	162,000	0.6	100,000-135,000	0.7-1.0
Ophthalmology			20,000	5.0			24,400-125,000	0.8-4.1
Orthopedic Surgery			20,000-35,000	2.9-5.0	28,900	3.4	27,800-76,900	1.3-3.6
Otolaryngology			25,000-33,000	3.0-4.0	70,400	1.4	25,600-62,500	1.6-3.9
Pathology			17,400-33,000	3.0-5.7			19,700-111,111	0.9-5.1
Pediatrics			10,000	10.0			4,300-18,200	5.5-23.3
Pediatric Surgery					780,227	0.1		
Plastic Surgery			50,000-150,000	0.7-2.0				
Psychiatry			4,800-14,300	7.0-20.8			12,500-38,500	0.8-7.7
Pulmonary Disease			100,000	1.0				
Radiology			7,400-20,000	5.0-13.5			14,400-100,000	1.0-6.9
Thoracic Surgery			100,000-200,000	0.5-1.0				
Urology			21,300-50,000	2.0-4.7			25,600-90,900	1.1-3.9

From: Review of Health Manpower Population Requirements Standards, DHEW Publication No. (HRA) 77-22

Table 8

RANGE OF SELECTED "REQUIREMENTS RATIOS"
GENERAL/FAMILY PRACTICE, GENERAL SURGERY, INTERNAL MEDICINE, OBSTETRICS-GYNECOLOGY

	Population Per Physician			
	Needs Based Ratio	Professional Judgment Based Ratio	Demand/ Productivity Based Ratio	HMO Based Ratio
General/Family Practice	2,123	2,000 - 4,000		2,300 - 30,303
General Surgery		9,436 - 10,000	11,650	8,056 - 58,824
Internal Medicine	1,042-14,347	3,846 - 20,000		2,192 - 14,286
Obstetrics-Gynecology	22,568	10,000 - 11,000		8,190 - 38,462

From: Review of Health Manpower Requirements Standards, DHEW Publication No. (HRA) 77-22

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TIME-TO-SERVICE STANDARDS

Health care is said to be a right rather than a privilege. As a consequence geographic barriers to entry into the health care system are deemed not acceptable and a geographic distribution of physician services consonant with equity of access for the population is encouraged. The geographic accessibility of resources within an area depends on the time and distance travelled to care. Particularly in rural areas, much effort has been directed toward reducing geographic and temporal barriers separating residents from facilities. Further, time and distance factors for urban and rural residents have acquired an even greater significance as out-of-pocket costs are reduced through the growth of third-party payments (Shannon et al., 1979).

No definitive studies have found to what extent lengthy travel times impact upon decisions to forego needed available medical care (Weiss, 1971; Ciocco and Altman, 1954; Bosanac, 1976; Parkin, 1979). However, geographically "inaccessible" populations have been characterized as having sociodemographic attributes associated with high medical needs (Bosanac, 1976; Aday and Anderson, 1975; DHEW, 1979; Acton, 1973). Residents of rural and inner city areas have less access to physicians than residents of suburban or metropolitan areas excluding the inner city.

Early studies (Jehlik and McNamara, 1952) of geographic accessibility stressed distance (mileage) rather than time, whereas more recent studies have taken into account differences between rural and urban areas by placing greater emphasis on travel time (SRI, 1968). Studies relating to travel time are divergent in method, although they usually deal with patient preferences (Shannon, 1979; Hershey, 1975; Kane, 1969). Some studies are large scale surveys, (NCHS, 1979; Aday and Anderson, 1975) and others are ideals proposed by planning groups (Wisconsin, 1972; Northern Virginia, 1980; Pennsylvania, 1975; Midland, 1978; Southeast Nebraska, 1978).

In the analysis of times-to-service, factors which should be taken into account include mode of transportation (e.g. bus or car), road surface, speed, terrain of area, climate and population preferences. It is generally recognized that travel times and distances increase with increased specialization of care, although different groups define specialty care differently. While consumer studies or surveys usually focus only on sociodemographic characteristics of the respondents, Kane looked at how realistic the desires and perceptions of consumers were in relation to travel patterns (Kane, 1969). He found that their desires were generally congruent with the general trade and travel patterns of the community. As they described the distances and their general expectations regarding willingness to travel to care, the responses formed a continuum in which distance varied with the specialization of the service. The consumers recognized that they would have to travel farther to get many of the more sophisticated services, while desiring the security of quick access to more basic services.

Use of time guidelines appears to vary widely, from a recognition of travel time as an important planning consideration to actual employment of standards (See Table 9). Based on a consensus of the literature, health planning guidelines, and health officials, a 30 minute travel time to nonemergent care has become a standard in health planning. Primary care manpower shortage area criteria suggest that utilization of medical services is seriously affected by travel times greater than 30 minutes (DHEW, 1978). A number of States have recommended that a large proportion of the population be within 30 minutes to nonemergency care. Public hearings in Pennsylvania produced standards for community health institutions which indicated that "a maximum travel time of 30 minutes (nonemergency) was appropriate." (Pennsylvania, 1975) A Wisconsin Health Task Force stated that "a broad range of health services should be available for all citizens as soon as practicable, within a one-way travel time of not more than 30 minutes." (Wisconsin, 1972). The Kentucky State Department of Health also recommended a 30 minute travel time standard for hospital care (Bosanac, 1976).

The Federal 30 minute standard is utilized as a mechanism to define a "rational service area." A shortage area must be "a portion of a county, or an area made up of more than one county, whose population, because of topography, market or transportation patterns, distinctive population characteristics or other factors, has limited access to contiguous area resources" as measured by a travel time greater than 30 minutes. Distances used to correspond to 30 minutes travel are: (1) 20 miles under normal conditions with primary roads available, (2) 15 miles in mountainous terrain or in areas with only secondary roads and (3) 25 miles on Interstate highways or in flat terrain. It is suggested that information on the public transportation system be used to determine travel times in urban areas (DHEW, 1978).

Data on time-to-service for emergency care are more variable and detailed and many standards have been proposed. The Texas Regional Medical Program recommended minimal time-to-service requirements for 14 medical ailments, most of which were emergency (Permian Basin, 1975). Using the Delphi method, members of the medical profession made judgments ranging from a minimal requirement of less than 15 minutes for a trauma involving head injury to less than 30 minutes for stroke. Also recommended were services required for treatment of the ailment ranging from a pharmacy to an intensive care unit. Most of the morbidities required a hospital with specialized facilities and emergency capability. This study reiterated the viewpoint represented by Dr. Richard Wilbur that fine-tuning in cases of emergency treatment beyond 15 minutes is not productive; when dealing with the Emergency Medical System (EMS), the type of condition should be specified (Wilbur, 1980). Dr. Wilbur also stated that except for acute emergencies, the length of time taken to obtain service is usually less important than the quality of the service. The quality is dependent on a number of factors beyond the presence of a qualified specialist.

A review of a number of health systems plans indicates that most seem to analyze travel times to emergency care as well as set attainable goals. However, the range of times and goals is rather broad, depending upon the metropolitan or nonmetropolitan nature of the area. In Northern Indiana, for example, a goal of the health systems agency (HSA) is that "EMS services should be available within a travel time of 60 minutes" while response times for emergency vehicles and personnel ranged from 3-4 minutes in urban areas to 20-30 minutes in other rural areas. Many HSA plans recommend a 10-minute response time for EMS in urban areas and a 20-minute response time for rural areas.

Obstetrical standards for hospitals are rarely described in the literature although travel-time and distance standards to short stay hospitals are frequently cited. The National Advisory Commission on Health Manpower reported that in 1967 "simple physical distance was not a major barrier for either urban or rural residents. Hospital facilities were within a 25 mile distance of all but two percent of the population, and only .01 percent had to travel more than 50 miles. In the urban areas, none of the population was more than 10 miles from a hospital." (National Advisory Commission on Health Manpower, 1967) In Kansas, short stay hospitals are accessible to 90 percent of residents within 30 minutes from home or work. Other HSA plans cite similar 30-minute standards to hospital care.

The Health Systems Plan for Southeast Nebraska recommends that "a source of inpatient obstetric services should be available within 30 minutes travel time." The Health Planning Council of the Midlands recommends a 30-minute travel time for 80 percent of the population for obstetric services. The Committee on Perinatal Health recommends services and facilities for caesarean section capability within 30 minutes at any hour.

Even less information on travel-time standards is available on pediatric services. The Omaha HSA recommended that services should be accessible within 1 hour for 80 percent of the residents of an area. No other information could be found. In addition, very few articles or health system plans provide information on travel-time to surgery. The Omaha Health Council recommends 2 hours for 80 percent of area residents to neurosurgery services, open heart surgery, organ transplant, and orthopedic surgery. However, it also suggests that anesthesiology services, general surgery, and diagnostic radiology be available to 80 percent of the population within 30 minutes. In addition a study is currently being undertaken by Dr. Clark Watts at the University of Missouri Medical Center which will indicate that "for good medical care the maximum a patient should be from a neurosurgeon is 100 miles--30

Table 9
RECOMMENDED TIME-TO-SERVICE STANDARDS BY FIVE MAJOR TYPZS OF CARE AND SOURCE*

Emergency Care		Child Care		OB/GYN		Adult Services		Surgical Services	
Time	Source	Time	Source	Time	Source	Time	Source	Time	Source
30 min Rural 10 min Urban	EMSS Act of 1973	1 hr	Omaha HSP**	30 min	Southeast Nebraska 1978	20 min Urban 40 min Rural	No Indiana HSP** 1977	50 min (Radiology)	Southeast Nebraska HSP**
10 min Urban 20 min Rural (response time)	Northern Indiana HSP** 1977			30 min 1/	CNH, 1977***	30 min	Southeast Nebraska HSP**	2 hrs 1/ 30 min 2/	Omaha Midlands HSP**
20 min	Southeast Nebraska HSP** 1978			30 min 2/	Omaha HSP**	30	HEW 1978	2 hrs	U of Mo Med Cntr 1980
10 min Urban 20 min Rural	Eastern Connecticut HSP**			30 min 3/	No. VA. HSP** 1979	30	Wisconsin HSP** 1972	2 hrs	Northern Virginia HSP**
15-30 min Trauma-head-15 Trauma-Mult-15 Gunshot -15 Poisoning -15 Myo Infarct-15 Burn -30 GYN Hemorr -30 Asthma -30 Stroke -30	Permian Basin Texas 1975			30 min 4/ 45 1 hr	No. VA HSP** 1979	30	PA 1972		
30 min (80%)	Midlands Omaha HSP** 1978			30 min (90 % Peak capacity for hosp)	Florida HSP** 1978	30	E. Conn HSP** 1979		
_ 60 min (EMS Services)	Northern Indiana HSP** 1977					30	KY 1972		
						30	No. VA HSP**		
						30 (FP) 30 (IM)	Omaha HSP**		
						30	N. Central GA 1978 HSP**		

1/ Cesarean Section
2/ 80% of population
3/ Hospital Services
4/ 2000 delivery hosp 30
1000 delivery hosp 45
500 delivery hosp 1 hr

1/ 80% of area residents Neurosurgery, Open Heart, Organ, Orthopedic
2/ Anesthesiology, general surgery and diagnosyic Radiology

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* There is a paucity of references by detailed specialty groupings, and they will not be included here.
** HSP = Health Systems Plan
*** Committee on Neonatal Health, March of Dimes.

minutes by helicopter, 2 hours or less by ambulance. Every community that had a neurosurgeon was identified, and a radius of 100 miles was chosen. It was found that there is essentially no place in the country (excluding four areas) that was not covered." (Watts and Adelstein, 1980)

What are the linkages between physician-population ratios and distance as measures of access? Sloan's investigations looked at variations in the physician population ratio and compared them to observed travel differentials (Sloan, 1977). He found that communities in which the patient's time commitment was the greatest tended to be the metropolitan areas. Further variations in the physician population ratio explained only a small proportion of travel (and waiting) time differentials. Yet Bosanac concluded that various travel time standards can assist in refining standard measures of physician availability (Bosanac, 1976).

Health Manpower Shortage Area criteria attempt to utilize both the physician-population ratio as well as the time-to-service concept in defining underserved areas for specific services. These criteria could be expanded to include general surgery, emergency services, obstetrical services, and pediatric services and standards could be developed like those which have already been developed for shortage area criteria in dental manpower, psychiatry, vision care, podiatry, pharmacy, and veterinary medicine.

RECOMMENDATIONS

RECOMMENDATION 9: GMENAC recommended that five basic types of health care services should be available within some minimum time/access standards: adult medical care, child care, obstetrical services, surgical services, and emergency services. In order to monitor the geographic distribution of physicians, GMENAC recommends that a minimum acceptable physician-to-population ratio for all areas in the U.S. be established. It was recommended that 50 percent of the GMENAC Modeling Panel ratio of physicians specialists per 100,000 for 1990 be established as the minimum acceptable ratio for all areas.

RECOMMENDATION 10: GMENAC recommends maximum travel times of 30 minutes for emergency medical care, 30 minutes for adult medical care, 30 minutes for child medical care, 45 minutes for obstetrical care, and 90 minutes for surgical care services for 95 percent of the population in 1990, recognizing that unusual circumstances may arise which make these travel times impossible to achieve for all areas.

RECOMMENDATION 11: GMENAC recommends that the definition of health manpower shortage area include minimum physician/population ratios and minimum travel times to service for general surgery, emergency medical services, and obstetrical services.

VI. TAXONOMY OF STRATEGIES TO IMPROVE THE GEOGRAPHIC DISTRIBUTION OF PHYSICIAN SERVICES

This report began by summarizing the recommendations of the Geographic Distribution Technical Panel (Part I). Part II presented the charges of the Panel as well as its history. Charge No. 1, covered in Part III, was a presentation of data on the geographic distribution of physicians by county accompanied by a literature review on physician location choice, and reasons for geographic variation. A discussion of the implications of procedure rate variations on manpower policy (Charge No. 3) followed a review of the evidence on variations in the rates by small area (Charge No. 2) and was presented as Part IV. Part V addressed issues of equity, access and the proper and adequate distribution of physicians and reviewed the literature on physician-population ratios and times to service. Part VI will describe the "Taxonomy of Strategies to Improve the Geographic Distribution of Physician Services," the culmination of all of the work of the Panel, including Charges 4-8.

The attached Taxonomy presents a set of action oriented recommendations from the Geographic Distribution Technical Panel. The recommendations are strategies which can be directed at one of three levels: undergraduate and/or graduate medical educational institutions, medical students and/or residents, and practicing physicians.

For each recommendation, the format described below was followed: first, a statement of the recommendation followed by a brief statement explaining it in more detail and then the advantages and disadvantages or pros and cons of each recommendation are presented. A complete list of citations, grouped with each recommendation, appears at the end of the section.

UNDERGRADUATE/GRADUATE MEDICAL EDUCATIONAL INSTITUTIONS (INCLUDING TEACHING HOSPITALS)

RECOMMENDATION 15: There is some evidence that selective admissions policies may improve the geographic distribution of physicians. A nationally mandated alteration in admissions policies is not recommended at this time; further study into the location decisions of students with particular ethnic or sociodemiographic characteristic is recommended. Selective admissions policies have been used to increase the likelihood that medical students will choose practice within a State or in an underserved area of a State by granting preferential admissions treatment to in-State residents or applicants with particular backgrounds or personal characteristics. Selective admissions policies may be used in conjunction with loans, service commitments, and the like. At the present time, outcomes of these programs do not warrant a nationally mandated policy.

Pros

- There has been adequate time to assess the results of selective admissions programs (this strategy has been used since 1948); however, data are conflicting and additional evaluation is needed. Some programs have been successful in adding to the numbers of practitioners in rural areas of particular States from the pool of students selected on a preferential basis.
- This strategy is theoretically an attractive policy device.

Cons

- These policies have practical problems. Causal relationships between individual traits and physicians' career and location decisions have not been clearly established.
- There is a high drop-out rate of preferential admissions program participants.
- These programs are susceptible to capricious management.
- The costs per retained physician are high.
- Questions as to the legality of preferential admissions policies have been raised.

Sources

Hadley, V. New York: (ed). Medical education financing policy analysis and options for the 1980s. New York: Prodist, 1980.

Stefanu, C. et al. Selection of Primary Care as a Medical Career: Demographic and Psychosocial Correlates. S Med J 73:924-927, July 1980.

Cuca, J. 1978 U.S. Medical School Graduates: Practice Setting Preferences, Other Career Plans, and Personal Characteristics. J Med Educ 55:465-68, May 1980.

RECOMMENDATION 16: Economic incentives (such as tax credits and deductions) and/or the provision of higher payment levels for services as an inducement for physicians to establish practice in underserved areas, should be explored.

While a major theme in specialty and location research is that physicians are unresponsive to differences in income opportunities, this assertion remains largely unproven. This strategy is similar to other financial incentives such as bonuses, direct grants, scholarships, and loan forgiveness which change the net present value of the physician's income stream. Use of this mechanism would increase net present values associated with practicing in underserved areas relative to those generated in adequately served areas. Income tax incentives could be provided at the Federal or State level. (Hadley, p. 195). This mechanism might be structured through tax credits, e.g., freeing a certain portion of the physician's income from the income tax, analogous to the tax credits allowed during 1978 for investment in insulation of residential homes for the purpose of energy conservation. Alternatively, the tax rate applied to a portion of a physician's income might be lowered. Reimbursement schemes might be changed to reflect higher payments for provision of services in underserved areas.

Pros

-- The pool of physicians who might be affected by a tax incentive program is much larger than the number of medical students eligible under loan or scholarship programs (Hadley, 1980, pp. 195-96).

-- The impact of a tax benefit program can be achieved more rapidly than loan or scholarship programs (Hadley, 1980, p. 195-96).

-- Thess mechanisms relate directly to the location decision of physicians rather than influencing the amount or types of services a physician would deliver.

-- See pp. 103-105, Recommendation 30.

Cons

-- There is no precedent in the use of these mechanisms.

-- It is not certain how large a tax advantage would be needed to attract physicians into underserved areas (Hadley, 1980, pp. 195-97).

-- See pp. 103-105, Recommendation 30.

Sources

Eichenholz, J. Reducing the supply of physicians in overserved areas (unpublished). June 13, 1978. Presented at Institute of Medicine, Health Manpower Policy Meeting, Washington, D.C. June 21, 1978.

Eichenholz mentions another type of tax incentive (disincentive), namely, encouraging graduated state licensure taxes and graduated taxes on issuance of narcotics numbers to all physicians.

Hadley, J. "State and local financing options," in Medical Education Financing, New York: Prodist, 1980.

Ernst, R.L. and Yett, D. "Econometric studies of the geographic distribution of physicians," in Physician Specialty and Location Choices Final Report on Grant #3330 from the Robert Wood Johnson Foundation, Human Resources Research Center, Accepted for Publication, Lexington, M.A., D.C. Heath & Co., May 29, 1979.

RECOMMENDATION 17: Demonstration projects should be developed and evaluated to determine the impact of differential rates of reimbursement for technology-intensive versus time-intensive (counseling, patient education) services upon the geographic distribution of physicians and services.

Research evidence indicates that differential economic valuation of medical care services implicit in reimbursement policies may have significant implications for the equitable distribution of health manpower. Presently there are financial incentives to perform in-office medical procedures and laboratory tests, which are often provided more frequently in large medical centers in urban areas. Even within primary care fields, substantial financial incentives exist to perform procedures and tests rather than personal services.

Pros

-- For example, using a standard conversion of the 1974 edition of the California Relative Value Studies (CRVS), a physician can charge $48.50 for a periodic annual physical examination, which is commonly scheduled for 45 minutes. Yet, performance and interpretation of an electrocardiogram, which usually requires a few minutes of the physician's time, carries a $28.00 charge. As Petersdorf emphasizes, current national health manpower policies emphasizing generalists rather than specialists are out of phase with current reimbursement mechanisms which preferentially reward specialty care (Schroeder and Showstack, 1978, p. 297).

-- A recent report suggests, for example that an internist can increase net income up to threefold by changing the service mix from one emphasizing consultative service to one emphasizing technological procedures and tests (Schroeder and Showstack, 1978, p. 294).

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- -- Another illustration is the fact that in some hospitals an all-night vigil for the treatment of diabetic acidosis or hepatic coma is rewarded with a standard $8.00 fee for professional care. In contrast, a 10-minute endoscopy in the same institution earns $100.00 (Seldin, 1976, p. 247).

- -- Relative valuation of services in benefit schedules should encourage physicians, or at least not discourage them, to provide those services deemed socially needed and beneficial, i.e., time intensive primary care services such as patient histories, physical exams, patient education, and counseling.

- -- Comprehensiveness of care, including health education and preventive measures, is an attribute essential to the practice of good primary care. The provision of a broad range of services, including services for basic medical problems, psychosocial problems, and health education, distinguishes the primary care practitioner from the secondary care practitioner and the referral specialist.

Cons

- -- There are two major arguments against offering third-party payment to physicians for providing health education and counseling services. First, it is difficult to assess the efficacy of many such services; second, it is possible that total health care expenditures may rise in the short run as a result of this change in reimbursement. The probability of an immediate increase in expenditures for health care must be weighed against the probability of future savings, both economic and in terms of human suffering.

Sources

Schroeder, S.A. and Showstack, J. Financial incentives to perform medical procedures and laboratory tests: illustrative models of office practice. Med. Care, 16:289-98, April 1978.

Seldin, D. W. Specialization as scientific advancement and over-specialization as social distortion. Clin. Res. 24:245-48, October, 1976.

RECOMMENDATION 18: It is recommended that practicing physicians and faculty convey to students that the practice of medicine can be delivered in a variety of geographic settings, including both rural and urban shortage areas. As a means of accomplishing this, urban and rural preceptorships for medical students should be continued and expanded in schools with an interest in monitoring such programs.

Role model development is aimed at changing the educational environment to stress the positive aspects of primary care practice and practice in underserved areas. Federal, State and private preceptorship programs are intended to influence physicians to establish practices in urban and rural underserved areas.

Pros

- Analysis of the locational decisions of 486 physicians and their spouses reveals that physicians now in practice in shortage areas link their choice to faculty role models in their residency programs and report that practice in shortage areas was valued highly by their faculty (Wilson, 1979).
- A 1978 assessment of preceptorship programs by Applied Management Sciences (1978) reported that preceptor location seemed to have a significant impact on the practice location of preceptees (Refer to Table 10).
- Programs sponsored by family medicine departments have been more likely than those in other specialties to emphasize primary care and rural service in their preceptorships, and to have preceptors located in underserved areas.
- Programs located in the South have had a significantly higher percentage of preceptors located in definitely underserved areas. The distribution of preceptors by specialty also differed according to region (Applied Management Sciences, 1978; refer to Table 11).

Cons

- Little significant evaluative work has been performed on educational innovations such as the influence of role models.
- There is contradictory evidence as to the efficacy of rural preceptorship programs in influencing physicians to practice in rural areas. The results of a study conducted by Steinwald and Steinwald (1975) indicate that the overall impact of preceptorship programs and other rural training programs is most pronounced with respect to urban-reared physicians in nonprimary care specialties.
- A good proportion of preceptorship programs (39.1 percent) are not located in medically underserved areas. Only 16 percent are in definitely underserved areas; 80 percent are not in critical shortage areas (Applied Management Sciences, 1978; refer to Table 12).

-- Programs do not have uniform goals (whether they are training programs, recruitment programs, or both), and vary as to length and timing of preceptorship, size of program, and voluntary or mandatory character of preceptorship experience (GAO, 1978, p. 73).

-- Additional data are needed. Estimation of program influence is difficult because programs are relatively new and long term data are not available. Cost effectiveness needs to be determined.

Sources

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Barish, A.M. The influence of primary care preceptorships and other factors on physicians' career choices. Public Health Rep., 94, 36-47, January-February, 1979,

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Steinwald, B. and Steinwald, C. The effect of preceptorship and rural training programs on physicians' practice location decisions. Med. Care 13:219-229, March 1975.

Table 10

PRACTICE LOCATION PREFERENCE OF STUDENTS AND RESIDENT PRECEPTEES BY LOCATION OF PRECEPTOR PRACTICE

Preferred Practice Location	Practice Location of Preceptor							
	Students				Residents			
	Inner-city	Rural	Other urban	Total	Inner-city	Rural	Other-urban	Total
Inner-city	8(28.6)*	5(17.8)	15(53.6)	28(6.5)**	1(11.1)	2(22.2)	6(66.7)	9(4.8)
Low income	(44.4)**	(2.5)	(7.1)		(14.3)	(2.9)	(5.4)	
Small town/	7(3.2)	130(59.6)	81(37.2)	218(50.6)	4(4.9)	38(46.9)	39(48.1)	81(43.3)
rural area	(38.9)	(64.4)	(38.4)		(57.1)	(55.9)	(34.8)	
Other urban	3(1.6)	67(36.2)	115(62.2)	185(42.9)	2(2.1)	28(28.9)	67(69.1)	97(51.9)
	(16.7)	(33.1)	(54.5)		(28.6)	(41.2)	(59.8)	
TOTAL	18(4.2)*	202(46.9)	211(49.0)	431(100.0)	7(3.7)	68(36.4)	112(59.9)	187(100.0)

* Row percent.

** Column percent.

Applied Management Sciences, An Assessment of the Influence of Medical Preceptorships and Other Factors on the Career Choice and Medical Education of Physicians. Unpublished final report of Contract HRA-231-76-0040. Executive Summary, March 31, 1978.

Table 11

DISTRIBUTION OF PRECEPTORS BY SPECIALTY ACCORDING TO REGION IN WHICH PROGRAM WAS LOCATED

Preceptor Specialty	Proportion of Preceptors in Each Specialty			
	Northeast	North Central	South	West
Family medicine*	39.7	65.7	73.7	58.0
Pediatrics*	26.4	7.2	7.4	13.2
Internal medicine	24.1	14.0	9.3	13.8
Other specialties*	9.4	12.8	9.5	15.0
Unknown	0.4	0.6	0.1	0.0

* Significant at .05 level

Applied Management Sciences, An Assessment of the Influence of Medical Preceptorships and Other Factors on the Career Choice and Medical Education of Physicians. Unpublished final report of Contract HRA-231-76-0040. Executive Summary, March 31, 1978.

Table 12

DISTRIBUTION OF ACTIVE PRECEPTORS BY SPECIALTY, FORM OF PRACTICE, AND MEDICAL SHORTAGE DESIGNATION OF PRACTICE SITE

Preceptor Characteristics	Number	Percent
Specialty		
Family medicine	2095	62.4
Pediatrics	392	11.7
Internal medicine	472	14.0
Other 386	11.5	
Unknown	14	0.4
Total	3359	100.0
Medically Underserved Area		
Definitely underserved	536	16.0
Perhaps underserved	1509	44.9
Definitely not underserved	1246	37.1
Unknown	68	2.0
Total	3359	100.0
Critical Shortage Area		
Definitely underserved	154	4.6
Perhaps underserved	449	13.4
Definitely not underserved	2428	72.3
Unknown	328	9.7
Total	3359	100.0

Applied Management Sciences, An Assessment of the Influence of Medical Preceptorships and Other Factors on the Career Choice and Medical Education of Physicians. Unpublished final report of Contract HRA-231-76-0040. Executive Summary, March 31, 1978.

RECOMMENDATION 19: Given the geographic distributional patterns of family practitioners, graduate medical education programs in family medicine should continue to be supported as a strategy to increase primary care services and their availability in certain geographic areas of underservice.

Federal support to hospitals and medical schools to develop, expand, and improve residency training programs in family medicine should be provided because data presently available show that graduates of family practice residency programs, more than physicians in any other specialty, tend to locate their practices in underserved areas. If graduates of residency programs in internal medicine and pediatrics make location choices similar to those of family practice physicians, then the recommendation should be broadened to include support for residency programs in these two primary care specialties.

Pros

-- Unlike physicians in general, family practitioners are concentrated in rural areas. In 1976, 54.9 percent were located in cities with populations of 30,000 or less, and 11.1 percent in cities with populations between 2,000 and 5,000. (Institute of Medicine, 1978, p. 52).

-- Establishment of departments of family medicine reflects increasing emphasis on primary care in medical school curricula.

-- Family practitioners are usually trained in ambulatory care settings. It is possible that these physicians are less likely to require a hospital in close proximity as a prerequisite for practice.

Cons

-- Since these programs are relatively new, results are just beginning to be discerned.

Sources

Institute of Medicine, A Manpower Policy for Primary Health Care. National Academy of Sciences: Washington, D.C., May 1978.

Geyman, J.P. Family practice in evolution: progress, problems, and projections. New Engl. Med. 298:593-601, March 16, 1978.

U.S. General Accounting Office, Progress and problems in improving the availability of primary care services in underserved areas. Report to the Congress by the Comptroller General of the United States.

Public Law 94-484-, the Health Professions Educational Assistance Act of 1976. October 12, 1976.

RECOMMENDATION 20: Incentives should be created to broaden residency educational experiences to encompass training in underserved areas, provided the appropriate resources are available and standards of education of the relevant accrediting body are met.

Because of research findings which suggest that the frequency and recency of a medical school graduate's contact with a specific geographic area influence the probability of practice in the area, residency experience in a geographic area has been considered as a mechanism for equalizing the geographic distribution of physicians. It was one of the strategies considered in the debates about Federal health manpower legislation in the early 1970s. The absence of clear-cut goals for geographic redistribution, uncertainty about linkage of location of residency to location of practice, and lack of methods and methodology for redistribution of residencies on a geographic basis led to the formation of GMENAC.

Pros

-- A variety of studies have lent support to the hypothesis that policies designed to attract physicians to a geographic area through residency training have a higher payoff in terms of physician retention than any other single medical training "event" (Statewide House Officers Training System, 1979, p.6).

-- Satellite training as part of a residency program is particularly suitable for attracting physicians in primary care specialties to underserved areas.

-- Both in rural and inner city areas, house officer training programs may be established in independent community centers and satellite facilities under the direct control of hospitals. Change in the structure and process of medical education appears to be a necessary component of any attempt to increase the numbers of physicians in these areas (Wilson, 1979).

-- Besides preparing physicians for practice in noninstitutional, low technology settings, this strategy would increase the supply of services in underserved communities.

-- Satellite centers which have a graduate medical education training component provide practicing physicians with an opportunity to establish collegial relationships with assigned house officers and program faculty.

Cons

-- The development of residency programs may not be feasible in areas where the population base is inadequate; it may be difficult to attract faculty and costly to refurbish or build new facilities.

-- Data on local needs and resources must be developed to facilitate the planning process for extension of residency programs.

-- Correlations between residency location and practice location which have been observed in the literature have used States as the unit of geographic analysis. This literature does not speak to the linkage between residency location and practice location within a given State (Statewide House Officers Training System, Inc., 1979, p. 10).

Sources

Statewide House Officers Training System, Inc., Alternative strategies for addressing the issues of physician specialty and geographic distribution through graduate medical education, May 16, 1979. Appendix H to Policy Proposal for Graduate Medical Education in Michigan, September 15, 1979.

California Office of Statewide Health Planning and Development, Graduate medical education in California: A position paper. Health and Welfare Agency, State of California, December 1978.

Wilson, S.R. An analytical study of physicians' career decisions regarding geographic location. Draft Digest of the Final Report, American Institutes for Research, Contract No. HRA-231-77-0088 prepared for DHEW, NCHSR, 1979.

Recommendation 21: Data suggest that nonphysician health care providers favorably affect the distribution of medical services by their tendency to select shortage area locations more frequently than is the case with physicians. It is recommended that nonphysician health care provider training programs should continue to be supported for this reason.

Because these programs train health care providers to deliver services traditionally provided by physicians only and improve the access to those services without compromising quality of care and often with considerable cost savings, continuation is appropriate.

Pros

-- Distributional patterns exhibited by nonphysician health care providers are favorable towards improving access to primary care services in underserved areas. Physicians' assistants and MEDEX tend to locate in nonmetropolitan areas more than physicians, while nurse practitioners work more frequently in inner city communities (Congressional Budget Office, 1979, p. 7; Weston, 1980; Sultz, 1978).

-- Nonphysician health care providers cost between $10,000 and $12,000 to educate versus approximately $60,000 for a physician (Congressional Budget Office, 1979, p. 26).

-- Under assumptions of national health insurance, changes in reimbursement policies, and increased support of health maintenance organizations, the potential of this strategy for cost effective provision of primary health care services is good (Congressional Budget Office 1979, xii-xiii).

Cons

-- It is difficult to estimate the effect of locational characteristics of nonphysician health care providers because of the relatively small number of this type of provider in practice (Morris, 1977, p. 1049).

-- Continuation of programs which would increase the supply of nonphysician health care providers may be contrary to cost containment efforts.

-- Training of nonphysician health care providers can be supported only when coordinated with other programs to assure the effective utilization of these personnel (refer to Section III, Practicing physicians).

-- Support of the training programs should be made contingent on strengthening their placement mechanisms to channel graduates into underserved areas.

-- Data are not available to measure retention of nonphysician providers in underserved areas.

Sources

Morris, S.B. The distribution of physician extenders. Med. Care 15:1045-57, December 1977.

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Congressional Budget Office, *Physician extenders: their current and future role in medical care delivery. background paper*, Washington, D.C., April 1979.

Scheffler, R.M.; Yoder, S.G.; Weisfeld, N. and Ruby, G. Physicians and new health practitioners: Issues for the 1980's. *Inquiry* 16:195-229, Fall 1979.

RECOMMENDATION 22: *Decentralized medical education programs such as WAMI (in Washington, Alaska, Montana, and Idaho) and WICHE (Western Interstate Commission for Higher Education) were developed to coordinate medical education and placement programs in a relatively isolated and sparsely populated region. These types of programs have been effective and attention should be given to their replicability.* Decentralized medical education is aimed at changing the educational environment to stress the positive aspects of primary care practice. Programs such as WAMI and WICHE provide a coordinated approach for increasing the number of primary care physicians trained and for redressing geographic maldistribution problems in States participating in these programs.

Pros

-- Results of a study of the WAMI program indicate that residents who completed community clinic rotations have increasingly chosen practice in small towns (Schwarz, 1979, pp.388-389; GAO, 1978, p. 82).

Cons

-- It may not be possible to isolate the "pure" effects of a changed educational environment on the career decisions of medical school graduates.

-- While programs such as WAMI and WICHE have been shown to have a modest effect on physicians' practice locations, it is unlikely that these programs will have a major influence on the geographic distribution of physicians nationwide.

Sources

Schwarz, M.R. The WAMI program: A progress report (Medical Education) West. J. of Med. 130:384-390, April, 1979.

RECOMMENDATION 23: GMENAC encourages the medical profession, through its training program directors and various specialty societies, in making decisions as to residency training programs to consider, in addition to the quality of residency programs, the aggregate number of programs, their size, and the geographic distribution of their graduates to better meet national and regional needs. Training program directors can assist in redistributing numbers of individuals among specialties and geographic areas according to goals established for meeting national and regional needs. Clearly, successes reported in some specialties indicate that program directors and specialty societies can influence the specialty distribution of physicians.

Pros

-- As a substitute for or in conjunction with public sector initiatives to solve geographic maldistribution problems, the profession can exercise leadership by influencing the specialty and geographic distribution of practicing physicians.

-- This strategy can be carried out by the voluntary sector.

-- Currently, most specialty societies are engaged in studies of the adequacy of numbers of physicians in their specialties. These data could assist in the overall determination of relative surpluses or inadequacies among specialties (GAO, 1978, p. 32). The Placement Bureau of the American Academy of Dermatologists has printed and distributed a map of the distribution of dermatologists by zipcode area to all training programs in order to encourage trainees to consider practicing in relatively underserved areas.

Cons

-- While considerable agreement exists on the need for additional primary care physicians, opinions differ as to what constitutes a sufficient supply in other specialties (GAO, 1978, p. 22). The problem of defining an adequate supply is complicated by the fact that certain specialists, other than primary care specialists, provide substantial amounts of primary care (GAO, 1978, pp. 10, 21; Aiken et al., 1979). Furthermore, there appears to be some question about the extent to which specialists and subspecialists should be relied upon to provide primary care.

Sources

Aiken, L.H. et al. The contribution of specialists to the delivery of primary care: a new perspective. New Engl. J. of Med. 300:1363-1370, June 14, 1979.

U.S. General Accounting Office, Are enough physicians of the right types trained in the United States? Report to the Congress by the Comptroller General of the United States. May 16, 1978.

American Medical Association, Profile of Medical Practice 1978. Chicago: American Medical Assocation, Center for Health Services Research and Development, 1978.

MEDICAL STUDENTS AND/OR RESIDENTS

RECOMMENDATION 24: The National Health Service Corps (NHSC) and the NHSC Scholarship Program for increasing the availability of primary care physician services an designated health manpower shortage areas impact favorably on the geographic distribution of physicians; therefore, NHSC and the NHSC Scholarship Program should continue to be supported.

The objectives of the NHSC were to improve the availability of health services in underserved areas and to encourage the permanent settlement of health professionals in the areas in which they were placed.

Pros

- -- The NHSC service and scholarship program have definitely improved geographic maldistribution problems by increasing access to primary care medical services in health manpower shortage areas.
- -- The potential of the NHSC program for increasing the productivity of NHSC physicians in existing sites and expansion of the program into a variety of underserved areas (e.g., inner cities) may enhance its future success (GAO, 1978, p. 40).

Cons

- -- Long-term retention rates have been poor, but appear to be improving.
- -- Adequate data are not yet available to estimate to what extent the goal of increasing permanent settlement (beyond the 2-year initial service period) has been achieved (Modderman, p. 26).

- The assignment of a minimum of two physicians to underserved areas appears uneconomical, although necessary. (GAO, 1978, p. 39). The trade-off between productivity and retention should be considered.

- Data which would allow the comparison of costs and benefits of this strategy with others are not available and should be developed.

- The strategy has so far not been successful in recruiting physicians to more remote, less populated areas (Modderman, 1979, p. 17-19).

Sources

Kane, R., Olsen, D., Wright, D., Kasteller, J., and Swoboda, J. Changes in utilization patterns in a national health service corps community. Med. Care 16:828-36, October 1978.

Michelsen, E. and Cronquist, N. Scholarships now for service later: Meeting the health manpower needs of medically underserved areas. Public Health Rep, 94:11-15, January-February 1979.

Modderman, M.E. The potential impact and the record to date of the national health service corps (NHCS), area health education centers (AHEC), and rural health clinics in terms of eliminating gross physician distribution problems. Prepared for the Geographic Distribution Technical Panel, GMENAC, 1979.

U.S. General Accounting Office, Progress and problems in improving the availability of primary care providers in underserved areas. Report to the Congress by the Comptroller General of the United States. August 22, 1978. Chapter 3, National Health Service Corps.

Sax, E. Review of incentive programs promoting practice in underserved areas. National Health Council, February 1976, pp. 22-23.

Recommendation 25: Governmentally sponsored loan and scholarship programs should be catalogued and evaluated to determine their effectiveness in improving the geographic distribution of physicians.

Too little is known about the success of loan and scholarship programs and the effectiveness with which they fulfill their purposes. For this reason it is appropriate that an organization within the Federal government (HHS, GAO etc.) undertake a careful evaluation of State as well as Federal loan and scholarship programs, particularly in light of the skyrocketing costs of medical education and the uncertainty about the large indebtedness of graduating physicians.

Pros

-- Financial support for the high costs of medical education is an important part of most programs designed to attract health personnel to underserved areas; however, success of these programs has been insufficiently documented, and a comparison of the effectiveness of both public and private programs is in order.

Cons

-- Evaluation efforts must be based on adequate data and criteria for evaluation. These have not been available to date for evaluations of loan programs.

Sources

Sax, E. Review of incentive programs promoting practice in underserved areas. New York: National Health Council, February 1976, pp. 2-5.

Hadley, J. (ed). Medical Education Financing Policy Analysis and Options for the 1980s. New York: Prodist, 1980.

RECOMMENDATION 26: Despite limited evaluation, there is evidence that several Area Health Education Center (AHEC) models are effective in inducing physicians to practice in underserved areas and/or to practice primary care. These types of AHECs should receive continued support.

To provide a regionalized organizational framework for coordinating health manpower education and health care delivery, individual educational and service institutions are linked to form an AHEC system. The AHEC concept was originally proposed by the Carnegie Commission in 1970, and is designed to provide a basis for institutional change by offering (1) new affiliation arrangements for increasing clinical training opportunities without additional medical school construction, (2) training opportunities located away from the health sciences center of the medical school, thereby increasing the delivery of health services throughout the AHEC region and adding stimulation to the professional environment for practicing physicians, and (3) training opportunities for allied health manpower.

Pros

-- These programs have long-term potential for significant impact on the distribution of health personnel in underserved areas. Efforts to increase the attractiveness of these areas for medical practice focus on the development of professional support systems.

-- The activities conducted by AHECs are varied. The greatest potential appears to be realized when AHECs are components of larger systematic efforts to improve health manpower distribution GAO, 1978, p. 70).

-- An analysis of the effects of AHECs between 1972 and 1976 shows that AHEC programs have had a significant impact on increasing the growth of physician/population ratios in AHEC target counties in comparison with other nontarget counties. The effect to date is believed to result from the attraction of practicing physicians and clinical faculty to AHEC counties, since few individuals trained in AHEC-related programs had established practices in the four years covered by the analysis (Modderman, p. 40-41).

-- Evidence suggests a high level of program acceptance among the medical community.

Cons

-- Programs vary as to level of development and because of the recency of their inception are not amenable to evaluation. Few individuals trained in AHEC-related programs have so far established practice (Modderman, p. 31).

-- Available financial data are not sufficiently detailed to permit comparison of the benefits of specific program elements with their costs.

-- AHECs lack a strong national strategic basis. Overlap with NHSC and rural health initiatives indicates a need to document common elements, operations, outputs, and measures of effectiveness of all strategies.

-- Systematic data are not available on parallel programs (called AHECs also) which have not received Federal funding.

Sources

U.S. Department of Health, Education, and Welfare, AHECs: A Response to Geographic and Specialty Maldistribution. Prepared under Contract No. 231-76-1109 for the Bureau of Health Manpower, Health Resources Administration, Washington, D.C. DHEW Publication No. (HRA) 77-61, 1976.

U.S. Department of Health, Education and Welfare. Report of the Secretary: An Assessment of the National Area Health Education Center Program prepared by the Health Resources Administration, Bureau of Health Manpower, Washington, D.C.: November 9, 1979.

Modderman, M.E. The potential impact and the record to date of the national health services corps (NHSC), area health education centers (AHEC), and rural health clinics in terms of eliminating gross physician distribution problems. Prepared for the Geographic Distribution Technical Panel, Graduate Medical Education National Advisory Committee, 1979.

U.S. General Accounting Office. Progress and problems in improving the availability of primary care providers in underserved areas. Report to the Congress by the Comptroller General of the United States. August 22, 1976. Chapter 5, Area Health Education Centers.

Sax, E. Review of incentive programs promoting practice in underserved areas. New York: National Health Council, February 1976, pp. 20-21.

RECOMMENDATION 27: Loan forgiveness programs modelled after those which have been successful should be used as a strategy for attracting physicians into underserved areas.

The goal of loan forgiveness programs is to attract physicians into underserved areas while making medical education financially accessible to students who could not otherwise afford it.

Pros

-- There are indications of success on Federal and State levels of loan forgiveness programs with some instances of respectable retention rates beyond the period of contractual service. Examples of successful programs are those conducted in Illinois and Kentucky (the Illinois Medical Student Loan Fund and the Rural Kentucky Medical Scholarship Fund). A common characteristic of both of these programs is a high degree of involvement in identifying, screening, and placing loan recipients (Hadley, 1980, p. 186; Sax, 1976, pp. 2-5).

-- It is generally agreed that the incorporation of more stringent penalty clauses into loan forgiveness agreements might reduce the incidence of "buying out" (Hadley, 1980, pp. 181-186). With attractive rates of loan forgiveness for each year of contractual service and high penalties attached to breach of contract, loan forgiveness programs may become increasingly promising. In Massachusetts, students who refuse service must pay back part of the difference between what they paid for their education and what it cost the State to educate them (Hadley, 1980, p. 187). Federal regulations have increased the penalty for failure to perform obligated service under the NHSC scholarship assistance, plus interest at the maximum prevailing rate. The sum is payable in one year ("Fact Sheet," 1979, p. 15).

-- On the other hand, "buying out" is not a totally negative feature. Although loan forgiveness is designed to assist in alleviating physician shortages, it is unrealistic to expect all applicants for forgiveness programs, many of whom are first-year students, to make irrevocable commitments as to where they will practice. Since buyouts do repay their loans, they provide funds which may be used by future applicants who decide to utilize the service payback option (Hadley, 1980, p. 186).

Cons

-- It is not known whether those who enter loan forgiveness programs would have settled in shortage areas without the inducement of such programs. Hadley (1980, p. 181) found it unlikely that many students who did not already have a strong interest in practicing in a shortage area would choose the loan forgiveness option.

-- Data which would allow one to calculate the cost for each year of physician service in an underserved area obtained through loan forgiveness programs are not available. In some States, the amount of maximum annual loans available was rather low, as a percentage of a student's total costs, and served as a disincentive to service paybacks. In 19 of 27 programs Hadley reviewed, the loan forgiveness buyout provision was too easy; it was simply repayment of the amount borrowed plus interest of no greater than 10 percent (pp. 181-86)

-- The percentage of physicians receiving loan forgiveness by practicing in shortage areas and the proportion retained beyond the period of contractual obligation also impact on the costs of these programs. Mason's analysis of State loan forgiveness programs (1971) indicates that payback and buyout provisions were generally liberal enough to discourage service paybacks, unless students were already predisposed toward rural practice (in Hadley, p. 181). The majority of States were fortunate if 60 percent of the borrowing physicians followed through on practice in rural areas (Mason, 1971, p. 576).

Sources

CONSAD Research Corporation. An evaluation of the effectiveness of loan forgiveness as an incentive for health practitioners to locate in medically underserved areas. A report prepared for the Department of Health, Education and Welfare, Office of the Secretary, Contract No. HEW-OS-73-68, Washington, D.C., 1973.

U.S. Dept. of Health, Education and Welfare, Fact Sheet: Health Professions Educational Assistance Act of 1976 (P. L. 94-484, as amended). February 1, 1979.

Hadley, J. (ed) State and local financing options, in Medical Education Financing, New York: Prodist, 1980.

Mason, H.R. Effectiveness of student aid programs tied to a service commitment. J. of Med. Educ., 46:575-83, July 1971.

PRACTICING PHYSICIANS

RECOMMENDATION 28: Comprehensive evaluations of programs to recruit and retain providers in underserved areas (e.g., Rural Health Initiative, Rural Health Clinics, Health Underserved Rural Area Program) should be performed after a reasonable period of time. Continued funding of these programs should be contingent upon a positive evaluation of their effectiveness.

P. L. 95-210 (the Rural Health Clinic Services Act of 1977) provides financial support for facilities using physician extenders to provide primary care in rural, medically underserved areas. Provider-based or independent facilities which meet specified criteria may be certified as rural health clinics and may receive Medicare and Medicaid reimbursement for specified ambulatory services. Reimbursement is provided for professional services furnished by nurse practitioners, physician assistants, nurse midwives, and specialized nurse practitioners. The Rural Health Initiative has been developed over several years since the enactment of PL 91-419, the Rural Development Act of 1972.

Pros

-- Reimbursement of services provided by nonphysician health care providers may assist in the recruitment of physicians to communities which have not been able to attract or retain doctors.

-- Under Federal regulations, services can be provided by physician assistants and nurse practitioners whether or not a physician is physically present at the time the service is provided (GAO, 1978, p. 106).

-- P. L. 95-210 also provides funding for demonstration projects for physician-directed clinics in urban medically underserved areas (Rural Health Clinic Services Act, Dec. 13, 1977, Section 3).

-- The Rural Health Initiative is designed to integrate various elements from multiple programs.

Cons

-- Reimbursement provisions under the Rural Health Clinic Services Act (P.L. 94-210) can be beneficial only in those States where regulations governing the practice and supervision of physician extenders are consistent with conditions stipulated in the act.

-- Very little evaluative information on the effects of rural health clinics on the availability or use of services in rural areas is as yet available. Data associated with program elements of the Rural Health Initiative have not been identified. Data on other aspects and strategies of the rural health initiative should be collected and examined.

Sources

Holland, C.D., and Durmaskin, B.T., Progress in development of rural primary care clinics in West Virginia. Public Health Rep. 94:369-71, July-August 1979.

Modderman, M.E. The potential impact and the record to date of the national health service corps (NHSC, Area Health Education Centers (AHEC), and Rural Health Clinics in terms of eliminating gross physician distribution problems. Prepared for the Geographic Distribution Technical Panel, Graduate Medical Education National Advisory Committee, pp. 44-47.

Public Law 94-210, Rural Health Clinic Services Medicare/Medicaid Amendments. December 13, 1977.

U.S. Dept. of Health, Education, and Welfare, Health Care Financing Administration. Rural Health Clinics Regulations, containing regulations as of July 1, 1978, on certification and Medicare and Medicaid coverage and reimbursement of rural health clinics under Public Law 94-210, enacted December 13, 1977.

Wallen, J. The geographic distribution of nonphysician health care providers. Background Paper prepared for the Geographic Distribution Technical Panel, July 1979.

RECOMMENDATION 29: Programs that foster or support group practice arrangements in rural areas, coupled with the appropriate communication and transportation networks, should be developed or established on an experimental basis as a means of attracting physicians to rural communities. If these delivery modes prove to be successful in delivering care to underserved areas, additional start-up funding should be encouraged for new programs. As an organizational framework for the delivery of medical care, group practice may be effective in redressing the geographic imbalance of physician services and especially primary care services. Whether this strategy succeeds on a long-term basis depends upon whether group practices can be located in areas of greatest need, and whether physicians can be successfully retained by rural communities using this approach.

Pros

-- Group medical practice emphasizes services provided by a group of primary care physicians, or by a primary care physician working in a team with nurse practitioners, physician assistants, and nurse midwives. Group practice guarantees access to a broad range of medical services.

-- Studies of recent medical graduates in primary care specialties give a high ranking to "the opportunity to join a desirable partnership or group practice" as a factor affecting location decisions (Cooper et al., 1975, p. 20). Of a group of physicians who left primary care practice for other medical careers, overwork was given as the chief reason for leaving.

-- Practice in a group setting has been shown to alleviate physicians' concerns about professional isolation, because of greater ease of collegial interaction. Research findings support the view that professional isolation is a strong deterrent to practice in rural areas (Steinwald and Steinwald, 1974, p. 16).

-- Group practice compares favorably with the option of solo practice in rural areas because of greater access to capital equipment, ancillary personnel and other facilities needed to provide thorough patient care. Primary care physicians choosing the multispecialty group practice delivery mode cited the following features as important in their decision: (1) freedom from the business aspects of medical practice, (2) predictable working hours, and (3) immediate access to other physicians for consultation and referrals (Madison, 1973, p. 761).

-- Potential long-term payoff for the redistribution of physicians to areas where they are most needed may offset the difficulties and costs encountered in establishing new delivery modes (Madison, 1973, p. 760). It has been shown that it is relatively easy for small communities to attract physicians when group practices already exist.

Cons

- Group practice does not easily overcome the perceived disadvantages of medical practice in rural areas; physicians seem to be attracted to nonmetropolitan areas which have relatively more of the characteristics of urban environments (Cotterill and Eisenberg, 1979, p. 150). Additional study is needed to clearly identify those characteristics of group practice that can successfully offset the disadvantages of rural medical practice.

- Investigators do not agree to what extent rural areas can support increases in group practices (Steinwald and Steinwald, 1974, p. 15). While group practice may be a "compensating factor" in physicians' choices to locate in rural areas, American Medical Association data indicate that this may not be the case in rural counties with a population of less than 10,000 (Langwell and Budde, 1978, pp. 104-106). In these counties, it may not be feasible to establish HMOs since they require a certain enrollment to break even.

Sources

Cooper, J.K., Heald, K., Samuels, M., and Coleman, S. Rural or urban practice: factors influencing the location decision of primary care physicians. Inquiry 12:18-25, March 1975.

Cotterill, P.G. and Eisenberg, B.S. Improving access to medical care in underserved areas: The role of group practice. Inquiry 16:141-53, Summer 1979.

Davis, K. and Marshall, R. Section 1502(1): Primary health care services for medically underserved populations, in Papers on the National Health Guidelines: The Priorities of Section 1502. U.S. Department of Health, Education, and Welfare, January 1977.

Eisenberg, B.S. and Cantwell, J.R. Policies to influence the spatial distribution of physicians: A conceptual review of selected programs and empirical evidence. Med Care 14:455-68, June 1976.

Langwell, K.M. and Budde, N. Urban-Rural differences in general and family practices: An examination of location choice incentives, in Reference data on socioeconomic issues of health, 1978. Chicago: American Medical Association, Center for Health Services Research and Development, 1978, pp. 101-119.

Madison, D.L., Recruiting physicians for rural practice. Health Serv Rep, 88:758-762, October 1973.

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Perkoff, G.T., An effect of organization of medical care upon health manpower distribution. Med Care 16:628-40, August 1978.

Steinwald, B. and Steinwald, C. The effect of preceptorship and rural training programs on physicians' practice location decisions. Chicago: American Medical Association, Center for Health Services Research and Development, November 1973 (revised April 1974).

Recommendation 30: Discontinuation of geographic differentials in payment levels by third-party payors when this is in excess of differences in costs of delivering those services as a means of influencing geographic distribution should be the subject of future research. Present reimbursement systems (Federal, State and private) tend to sustain historical differences in fees and incomes among geographic areas and thus provide incentives for physicians to locate in high income communities within metropolitan areas.

Under the UCR method (usual, customary, and reasonable charges) large differences in payment exist for the same procedure. To illustrate, the maximum Medicare would pay in 1977 for a lens extraction in Buffalo, New York, was $561, compared to $957 in the Bronx, $1,085 in Manhattan, and $480 in Arkansas. Thus, to the extent that Medicare reinforces existing physician fee differences between metropolitan and nonmetropolitan areas, the Medicare program provides incentives for doctors to locate in high-charge areas, potentially increasing the problem of geographic maldistribution of physicians (Showstack et al., 1979, p. 237). The establishment of uniform reimbursement levels within a geographic area, such as a State, would appear to eliminate the financial disadvantage to practice in underserved areas.

Pros

- The present reimbursement system does not appear to be neutral vis a vis the geographic distribution of physicians; it can be revised to create incentives (or at least, to remove disincentives) for physicians to locate in underserved areas.
- Reimbursement methods can be redesigned so as to bring the distribution of services more in accord with social objectives.

Cons

- Implications of the preceding may be counter to cost containment, at least in the short run.
- Policies aimed at equalizing fees across areas in and of themselves may not provide sufficient inducement to redistribute physicians and possibly may decrease work effort.

-- The impact of discontinuation of fee differentials has not been determined.

Sources

Institute of Medicine, A manpower policy for primary health care. National Academy of Sciences, Washington, D.C., May 1978.

Burney, I.L., Schieber, G.J., Blaxall, M., and Gabel, J.R. Geographic variation in physicians' fees (Special Communication). JAMA, 240:1368-71, September 22, 1978.

> "To study geographic differences in physician fees recognized by the Medicare and Medicaid programs, we analyzed physician reimbursement rates at the national, State, and county levels. The results indicate that nationally, Medicaid specialist fees are 77 percent of Medicare specialist fees. Medicare specialist fees in metropolitan areas are 23 percent higher than those in nonmetroplitan areas, but there are no differences under Medicaid. State Medicare specialist fees varied from 73 percent to 132 percent of the national Medicare average, while Medicaid specialist fees ranged from 49 percent to 179 percent of the national Medicaid average. State Medicaid fees for specialists ranged from 39 percent to 100 percent of Medicare specialist fees. These results indicate that under national health insurance, fees set at national or statewide levels could have notable effects on physician remuneration in some localities."

Cantwell, J.R. Implications of reimbursement policies for the location of physicians." Agriculture Econ Res, 31:25-35, April 1979, p. 30.

> "If prevailing charge levels are established at higher levels in urban than in rural areas, we can expect availability of physicians' services in rural areas to be affected adversely. One policy which merits consideration is to actively use the reimbursement system to encourage physicians to locate in areas lacking them. A first step in implementing this policy within the Medicare program would be for the carrier to set limits on prevailing charges which would make them uniform throughout a State."

Gabel, J.R. and Redisch, M.A. Alternative physician payment methods: incentives, efficiency, and national health insurance. Health and Society, 57:38-59, 1979, pp. 50-54.

Showstack, J.A., Blumberg, B.D., Schwartz, J., Schroeder, S.A. Fee-for-service physician payment: Analysis of current methods and their development. Inquiry. 16:230-59, Fall 1979.

RECOMMENDATION 31: GMENAC recommends that all physicians, both those in primary care specialties and those in non-primary care specialties, be reimbursed at the same payment level for the same primary care services.

To increase the availability and quality of primary care services, changes in the structure of reimbursement methods are required. Physician manpower policy has emphasized the production of more primary care physicians treating populations in underserved areas, while current reimbursement policies tend to show fiscal rewards for nonprimary care physicians in adequately served areas (Hadley, 1978; Cantwell, 1977) Cantwell found that general practitioners' mean fees were significantly lower than specialists' mean fees (Cantwell, 1977). The Institute of Medicine estimates that specialists are reimbursed an estimated 7 percent more for the same procedure than are general practitioners (Institute of Medicine, 1976, p. 335). Available evidence is that Medicare "allowed" charges have increased more rapidly for surgeons than for primary care physicians (Institute of Medicine, 1976, p. 345). Existing physician maldistribution problems may be exacerbated by the UCR method of reimbursement (Showstack et al., 1979, p. 237). See Tables 13 and 14.

Pros

-- This strategy lessens the financial disincentive to enter primary care specialties by equalizing third-party payments to all physicians for the same primary care services, and allows equal payment for identical services of acceptable quality (Institute of Medicine, 1978, p. 49).

-- This mechanism also lessens the incentive of nonprimary care physicians to deliver primary care services. This may prove to be advantageous because nonprimary care physicians may not be as well trained in the primary care role as in the specialty role, and there may be a tendency to use specialty skills and procedures when these are not needed (Institute of Medicine, 1978, p. 49).

-- It is possible that the cost of primary care services may be reduced through this change in reimbursement methods.

Table 13
GP AND SPECIALIST FEES IN CALIFORNIA

Procedure (1969 CRVS)	Specialty Designation	Mean	S.D.	C.V.
Medical Visit				
Initial Office Visit (90000)	GP	$ 17.18 (115)	$ 5.27	.31
	Specialist	25.86 (270)	12.69	.49
Follow-up Office Visit (90040)	GP	11.99 (118)	3.03	.25
	Specialist	13.88 (284)	3.84	.28
Periodic Examination (90088)	GP	33.56 (113)	15.30	.46
	Specialist	30.81 (196)	14.79	.48
Follow-up Hospital Visit (90240)	GP	19.41 (108)	11.79	.61
	Specialist	21.23 (249)	12.05	.57
Surgical				
Appendectomy (44950)	GP	397.31 (29)	139.75	.35
	Specialist	418.93 (45)	79.11	.19
Tonsillectomy(42840)	GP	166.87 (38)	44.46	.27
	Specialist	179.24 (31)	42.72	.24
Hernia Repair (49505)	GP	390.61 (28)	136.45	.35
	Specialist	407.81 (42)	77.97	.19

Table 13 (continued)

GP AND SPECIALIST FEES IN CALIFORNIA

Procedure (1969 CRVS)	Specialty Designation	Mean	S.D.	C.V.
Distal Radial Fracture (25605)	GP	148.54 (35)	60.81	.41
	Specialist	182.36 (28)	61.61	.34
Obstetrical Care (59400)	GP	356.04	82.88	.23
	Specialist	481.19 (42)	121.02	.25
Radiological x-ray of Forearm (73090)	GP	18.15 (38)	4.92	.27
	Specialist	(61)		
Laboratory Red Blood Cell Count (85020)	GP	5.60 (56)	2.28	
	Specialist	6.28 (73)	2.65	.42
Urinanalysis (81000)	GP	4.05 (91)	1.15	.28
	Specialist	4.89 (134)	2.27	.46

Source: Tenth Period Survey of Physicians (Fall 1975), Center for Health Services Research and Development, American Medical Association.

In James R. Cantwell, "Physician Fee Variation and Reimbursement in California and Georgia." Working Paper No. 7803, delivered at the Medical Economics Session, Western Economic Association 1977 Meetings, Anaheim, California, June 22, 1977.

Table 14
GP AND SPECIALIST FEES IN GEORGIA

Procedure (1969 CRVS)	Specialty Designation	Mean	S.D.	C.V.
Medical Visit Initial Office Visit (90000)	GP	$ 14.92 (18)	$ 7.82	.52
	Specialist	22.41 (48)	16.66	.74
Follow-up Office Visit (90040)	GP	9.44 (16)	2.37	.25
	Specialist	29.77 (40)	16.07	.54
Follow-up Hospital Visit (90240)	GP	11.42 (13)	5.38	.47
	Specialist	16.89 (40)	8.50	.50
Surgical Appendectomy (44950)	GP	-		
	Specialist	274.17 (12)	69.38	.25
Tonsillectomy (42940)	GP	-		
	Specialist	156.11 (9)	33.15	.21
Hernia Repair (49505)	GP	-		
	Specialist	261.50 (10)	31.80	.12

Continued

Table 14 (continued)
GP AND SPECIALIST FEES IN GEORGIA

Procedure (1969 CRVS)	Specialty Designation	Mean	S.D.	C.V.
Distal Radial Fracture (25605)	GP	84.58 (6)	24.00	.28
	Specialist	-		
Obstetrical Care (59400)	GP	-		
	Specialist	335.83 (6)	92.76	.28
Radiological X-ray of Forearm (73090)	GP	11.94 (8)	2.24	.19
	Specialist	13.81 (9)	3.91	.28
Laboratory Red Blood Cell Count (85020)	GP	5.55 (10)	2.39	.43
	Specialist	3.77 (13)	1.95	.52
Urinalysis (81000)	GP	3.36 (14)	1.01	.30
	Specialist	3.57 (22)	0.93	.26

- Sample size less than 5.

Source: Tenth Periodic Survey of Physicians (Fall 1975), Center for Health Services Research and Development, American Medical Association.

In James R. Cantwell, "Physician Fee Variation and Reimbursement in California and Georgia." Working Paper No. 7803, delivered at the Medical Economics Session, Western Economic Association 1977 Meetings, Anaheim, California,
June 22, 1977.

Cons

-- Implementation of this strategy could potentially decrease the amount of primary care services available in those areas and settings where specialists participate substantially in the delivery of primary care (Aiken et al., 1979).

Sources

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APPENDIX

LITERATURE REVIEW OF SELECTED FACTORS AFFECTING LOCATION DECISIONS OF PHYSICIANS

This review was developed for use by the Geographic Distribution Technical Panel in its deliberations. The appendix was not voted on by GMENAC as a whole.

This review was prepared by Mary L. Westcott, Program Analyst, Office of Graduate Medical Education, Health Resources Administration.

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Introduction

The Graduate Medical Education National Advisory Committee (GMENAC) was chartered by the Secretary of the Department of Health, Education, and Welfare on April 20, 1976 to make recommendations on the present and future supply and requirements for physicians and their specialty and geographic distribution. The Geographic Distribution Technical Panel of GMENAC was established in 1979 to address concerns related to access and equity in the current availability of medical care services. An exploration of the underlying causes of the geographic problem, as well as reasons for physician location choices was undertaken.

The results of this exploration are presented in the following pages as a comprehensive up-to-date literature review encompassing some 90 factors and 160 bibliographic references. The review is the most current and comprehensive available to date. (see Institute of Medicine, 1976; Cantwell, 1975 and Long, 1975). A number of previous attempts have been made to organize the literature on physician location factors (Cooper et al., 1972; Cantwell, 1975; McFarland, 1972, and Crane and Reynolds, 1974). The following schema is derived largely from Crane and Reynolds, with slight modifications.

The classification scheme is divided into three major sections--Influences, Objectives, and Decision Factors. Influences are representative of social and personal forces which can shape and direct the objectives a physician has for his/her lifestyle and practice. Objectives suggest general and specific criteria which a physician may use in choosing a practice location. Decision Factors provide information on environmental, practice-related, and demand-related decision factors which can describe, explain, or predict physician location (Crane and Reynolds, 1974).

The task of clarifying and identifying definitions of variables has not been attempted. Many of these variables are overlapping and much work needs to be done on conceptualizing the variables. "Community size" may refer to a demand-related decision factor or an influence, and may be defined operationally in a number of ways (small, medium, or large communities; rural-urban, by population). There is the additional problem that each factor cannot always be separated into a discrete influence.

The following is a summary of the major findings of this literature review. It should be noted at the start that research on physician location is generally divided into efforts to explain the distribution of currently practicing physicians and efforts to explain the locational behavior of new physicians. In terms of policy implications, new physicians are highly mobile, and action to influence their locational behavior is considered far more feasible from a political standpoint than measures to change established physicians' locations. It should also be pointed out that no consensus exists on the most salient factors influencing distribution, and thus on the direction for public policy.

Influences: Background Factors

Several categories of influences have been reported to affect location decisions. These include the geographic background of the physician, such as place of residency, or some combination of geographic origin, medical school, internship and residency location. A recent study found that National Health Service Corps (NHSC) physicians who eventually locate in rural areas and those who locate in urban areas are not differentiable in terms of background (Wilson, 1979). The study found, however, that physicians who entered practice in non-National Health Service Corps (NHSC) rural areas usually attended medical schools located in a relatively small community, had residency experience in a nonhospital setting and/or in a rural area, and had a rural background (Wilson, 1979). Although type of background appears to be an important variable in determining whether a physician decides to practice in a rural community, another study reported that it was not sufficient to compel them to continue practice (Parker and Sorenson, 1979). The research results are not yet in on long-term retention in rural or shortage areas.

Objectives

Physicians' choices are not only affected by their sociodemographic characteristics and origin, but individually they have a number of personal objectives regarding their life-styles. Both the physician and spouse have a set of preferences with respect to careers and place of residence, which includes the role of other individuals. These preferences or goals can be family-oriented, economic, prestige-oriented or professional. For example, personal preferences about work content and the degree of professional stimulation in the work environment are major determinants of career choices. The Government Accounting Office found rural physicians generally more influenced by personal and community factors, and urban physicians more influenced by factors related to the practice of medicine. Hassinger (1979) found that when rural physicians characterize the salient differences between urban and rural practice, they emphasize the quality of patient-physician interaction, while urban physicians cite lack of facilities and support personnel. These conclusions are borne out by Wilson's data which indicate that students from rural areas, who are not interested in research or teaching, are more likely to locate in rural areas.

Decision Factors

The decision factors which a physician considers in practice-location choices can be numerous, but basically involve: (1) The environment of the area; (2) the type of practice he/she will be able to pursue, and (3) the perception of demand and need for services in an area (Kane et al., 1979). Although these may each impinge on location choice, they are not necessarily decisive in all cases. It is clear that the communities with the fewest resources will have the greatest difficulty attracting providers. Surveys of physicians indicate that community characteristics such as cultural and recreational opportunities, climate, the quality of the educational systems and the wealth of an area may play a predominant role in the decision-making process. However, it should be noted that these factors are not very amenable to policy manipulation. It should also be noted that anecdotal information from physicians about an area (need, demand, income) can play an important, although undocumented, role in the decision-making process.

Some studies strongly suggest that one of the factors necessary for retaining physicians in rural areas is good professional support. Professional considerations that often figure prominently in a physician's choice of practice location include the availability of clinical and/or hospital facilities, the opportunity for contact with other physicians, and the possibility of continuing education. Again, it is difficult to assess the relative importance of the factors--professional, sociodemographic, personal--that influence the recruitment and retention of physicians in rural areas.

Considerable attention has also been devoted to the influence of economic factors on physician distribution. Research to date has not shown a strong correlation between economic factors and specialty or location choice. Both fees and incomes vary considerably by urban-rural area, region and State. Except for Canadian studies, research relating physician location, or geographic distribution, to income differences has not shown a strong relationship. This may be due to: (1) Social taboos against citing income as a motivation factor; (2) the lack of good data, or (3) the intercorrelation of the variables and inability to separate out factors. It is possible that physicians do take fee levels into account in making location decisions (Institute of Medicine, 1979), but the available evidence presents no firm conclusions.

A number of factors are important in affecting the demand (or perceived need) for health services: These include population size, age (population 65+), income of the population, education (affecting utilization), physician income and the existence of Federal programs. Most research has dealt with population size, per capita income, and physician income. Results show the migration of physicians to well-populated areas with high per capita incomes.

Summary

Many of the factors analyzed here are presented at the individual level and others at the community level. A regression analysis of community factors affecting physician distribution differs markedly from a physician survey of reasons for practice locations. This complicates the development of any kind of a coherent model and makes it difficult to sort out the importance of each factor reviewed here.

The question that must be answered prior to development of policy interventions to correct the distribution problem is: What is the relative importance of each of the professional, sociodemographic, lifestyle, personal, community and demand-related factors in influencing recruitment and retention of health providers in 'needy' areas? Studies that analyze demand and community characteristics fail to take account of individual differences--studies that only look at individuals' preferences and abilities fail to look at the context in which the individual operates. A merging of these two separate spheres must take place before a complete analysis of physician distribution can occur. Perhaps the next decade of researchers addressing this problem can come to grips with this issue.

GMENAC Geographic Distribution Panel

Summary Table:

Selected Factors Affecting Location Decisions of Physicians

VARIABLES	MAJOR FINDINGS
I. INFLUENCES	
A. Family	Several studies have shown that family ties and wives' preferences affect location choice (Hassinger, 1963; Bible, 1970; Champion, 1971). Rural and small town physicians and their wives tend to come from small communities (Hassinger, 1963). Taylor, Dickman and Kane found that families in which both partners were from the same background had striking preferences for living in an area similar in size to their own (1973). Twenty-six percent of physicians in a later study said their spouses had connections in the area or were attracted to it (Parker and Sorensen, 1978). Physicians in Wilson's non-National Health Service Corps sample who were in rural areas were more likely to have spouses raised in a rural area (1979). Also found was the fact that rural retention is better for those physicians whose spouses did not have any graduate education. An earlier study by Cooper et al. had reached similar conclusions, but stressed the fact that if a wife felt that opportunity for her own
1. Spouse	

VARIABLES	MAJOR FINDINGS
I. INFLUENCES (cont'd) A. Family (cont'd) 1. Spouse (cont'd)	career was important, the physician was more likely to choose an urban location (1975). Hassinger stated that in general the locational background of the spouse reinforces the tendency for physicians of rural origin to practice in rural localities and physicians of urban origin to practice in urban areas (1979). However, Parker and Tuxill placed influence of spouse low on a list of factors which deterred physicians from locating in a small community (1967). Generally, the spouses' role in location decisionmaking did not appear to be highly influential (Wilson, 1979).
2. Father's Occupation	Schaupp studied migration of West Virginia medical graduates and found that those remaining in West Virginia had fathers who were blue collar workers and were married to natives of the State (1969). Champion argued that metropolitan physicians as a group have higher social origins than non-metropolitan physicians (1971). Cordes found that 17 percent of the doctors he studied had fathers who were either physicians, dentists, or pharmacists--a disproportionately large number of the physicians came from family backgrounds characterized by relatively high socioeconomic status (1978). Hassinger concluded that fathers' occupation is not an important predictive variable for understanding eventual practice location (1979).

VARIABLES	MAJOR FINDINGS
B. Social	
1. Friends	When Bible asked what factors influenced physicians to choose their present location, family and friends were cited as a major influence (1970). When asked how they decided upon their present practice location, more than half indicated friends (Bible, 1970). The GAO reported that one of the influences found to be most important in location choice was "personal influences" (GAO, 1978). The small community physician in one study felt his colleagues' decisions were influenced by others (such as professors, relatives, etc.) whereas their influence was minor in his own decisionmaking (Parker and Tuxill, 1967). About nine percent of Cooper's survey physicians reported that the influence of family and friends ranked among the top three location factors (Cooper et al., 1975). On the other hand, Parker and Tuxill described the influence of parents or relatives as not particularly strong. Others also felt that the desire to locate near family or friends seemed to influence only a small percentage of practitioners (Peterson, 1968; Charles, 1971; Heald, 1974).
2. Other Physicians	Eight percent of physicians in one study said that association with older physicians influenced their decision in finding their current practice location (Bible, 1970). Only two percent of the

VARIABLES	MAJOR FINDINGS
I. INFLUENCES (Cont'd) B. Social (Cont'd) 2. Other Physicians (Cont'd)	1965 graduates of medical schools in another survey found the advice of an older physicians as ranking among the top three reasons for locating where they did (Cooper et al., 1975). About 16 percent of physicians interviewed by Parker and Sorensen cited the influence of teachers in medical school or later training as a factor which influenced them to settle in a small community (1978).
3. Community Recruitment	A survey of 1971 medical school graduates showed that rural physicians were generally more influenced by community recruitment efforts than were urban physicians (GAO, 1978). Only two percent of 1965 medical school graduates found organized efforts of community recruitment an influential factor (Cooper et al., 1975). The location decision for 29 percent of physicians surveyed by Cordes included the fact that they were recruited by individuals within the community (1978). Community recruitment did not affect the probability of rural choice, according to Coleman, but did attract some primary care groups if there was an interest in medical need, availability of loans and the prospect of influence in the community (1976). Wendling demonstrated that local community efforts to recruit physicians was a significant variable in the western regions of the U.S. explaining physician location (1978).

VARIABLES	MAJOR FINDINGS
C. Professional	
1. Specialization	AMA data on the distribution of office-based physicians in 1975 showed that 22% of all general and family practitioners lived in counties of less than 50,000 persons as opposed to 5% of medical specialists and 7% of surgeons (Goodman and Mason, 1976). It appears that general practitioners are attracted to small communities (Presser, 1975) and tend to come from small towns (Coker, 1960; Paiva and Haley, 1971, and Kritzer and Zimet, 1967). However, Rushing found the attraction of larger communities for general and narrow specialists is stronger than the attraction of small and rural communities for generalists (1975). Coker concluded, on the other hand, that a "greater proportion of students who prefer to practice in a rural setting intend to enter general practice, while students who prefer large cities intend to specialize (1960). Cullison et al. demonstrated that hometown size and specialty choice may be interrelated determinants of practice county size (1976). Their data showed that the graduate entering family medicine was three times more likely to select non-metropolitan practice as a physician entering the other primary care specialties of internal medicine, pediatrics, and obstetrics/gynecology (Cullison et al., 1976). In Hassingers' study, specialization was characteristic

VARIABLES	MAJOR FINDINGS
I. INFLUENCES (cont'd) C. Professional 1. Specialization	of the type of practice which led to urban locations (1979). At the national level, Wendling et al. found practice specialty to be related to location choice. A general practitioner was more likely to select a shortage county in the North Central Region as compared to the West (1978). It seems clear that increased specialization involves a greater reliance on other physicians and hospital-based care, both of which tend to be found in large urban centers (Werner, 1978).
2. Medical School: a. Ownership	No significant research has been performed on the relationship between practice location and the totality of medical school characterisitics. One study showed that State-owned medical schools retain about 50 percent of their graduates while private schools retain 40 percent (Yett, 1973). Held believed it is important to differentiate between graduates of medical schools that are known to be very selective of applicants (private schools) and those from the less selective schools. He found that graduates from the private schools showed a greater tendency to enter into practice outside their home State. This pattern did not prevail in New York and California, where the majority of graduates from both private and public medical schools tended to remain in those states (1973). Graduates of southern medical schools were also less likely to leave their State

VARIABLES	MAJOR FINDINGS
I. INFLUENCES (cont'd) C. Specialization (cont'd 2. Medical School (cont'd) a. Ownership (cont'd)	to practice. However, data on 1,850 graduates in 28 medical schools collected by the AAMC found the type of medical school attended was not a useful predictor of location choice. Even when characteristics of the medical school were entered into the analysis, their contribution to the prediction of practice location was minor (Erdmann et al., 1979).
b. Quality	Breisch (1970) found that quality of medical school education and location of medical schools accounted for almost 50 percent of the variation in location of practice. The higher the quality of the medical school's training program and the more urban its location, the more likely graduates would seek urban practice location. More recent studies indicate that type of medical school and characteristics of the medical school are not useful predictors of location choice (Erdmann, 1979).
c. Socialization: Faculty	Some argue that medical schools turn out specialists who learn that it is preferable to deal with only one type of patient (urban middle class). Students are selected who seem most likely to mirror the attitudes and orientations of medical faculty members (Bynum, 1972). Even for students from rural States, "the cumulative effect of current medical education is to dissipate their interest in becoming generalists" (Taylor, 1973). Sixteen percent of

VARIABLES	MAJOR FINDINGS
I. INFLUENCES (Cont'd) C. Professional 2. Medical School: c. Socialization: Faculty	physicians cited the influence of teachers in medical school or later training as a factor which influenced them personally to settle in a small community (Parker and Sorensen, 1978). The respondents of all previous surveys by Parker and Sorensen generally felt that medical school faculty members displayed a negative attitude toward rural practice (1979). A survey of residents by the Institute of Medicine showed faculty influences to be a major factor in their choice of specialty (1979). Wilson concluded that physicians now in practice in shortage areas tend to see the faculties of their residency programs as having valued certain shortage area careers more highly than does the average faculty (1979). "That family practice and rural medicine are so often viewed as complementary underscores the need for positive role models and experiences in rural family medicine." (Taylor, 1973). Cullison felt that very few determinants of practice location could be influenced by the medical school, but the medical school could select students with rural backgrounds, and through its curriculum, influence specialty selection of its graduates (1976).
3. Placement Services	In finding a location to practice, physicians used the assistance of State and AMA physicians placement services (Bible, 1970).

VARIABLES	MAJOR FINDINGS
D. Financial Incentives	
1. Loan Forgiveness	Mason found that only one State loan forgiveness program had been very successful, while in the majority of States about 60 percent of the borrowing physicians did not complete their obligation (1971). In all of the State programs, one-third chose to buy out of their obligation to practice in a small community. The CONSAD Research Corporation found that the Health Professions Education Assistance Act (P.L. 94-484) loan forgiveness program had little success and that higher service repayment rates could be effected from more careful selection of loan recipients (1973). Although medical students were given $155 million in scholarships and low interest loans, only 86 physicians had portions of their loans cancelled in return for establishing practices in designated shortage areas (Parker and Sorensen, 1978). The Human Resources Research Center found that loan programs are attractive to substantial numbers of medical students, but substantial numbers of physicians buy out of their service obligation (Yett, 1973). Disproportionately more loan recipients who fulfilled their service obligations come from rural backgrounds. Little is known of the extent to which loan forgiveness programs induce physicians to settle permanently in medically underserved areas.

VARIABLES	MAJOR FINDINGS
I. INFLUENCES (Cont'd) D. Financial Incentives (Cont'd) 1. Loan Forgiveness (Cont'd)	Sinclair Coleman reported that payment of a forgiveness loan affects how rural the practice location is among rural general practitioners (GPs) though not the GP's probability of selecting a rural practice. Loan forgiveness was not found to be related to location type for nonprimary care physicians. (Coleman, 1976; Cooper et al., 1975). Recent surveys have shown that the loan forgiveness program exerted little influence on eventual practice location (GAO, 1977; Wendling, 1978). However, in their recent study of the effects of debt on medical students' career preferences, Mantovani et al. (1976) did report that students with large debts exhibited much stronger interests in practicing in physician-shortage areas than those with no debt, regardless of other background traits (sex, race, marital status, size of home town, and parental income). Although they did not indicate the source of debt, it is possible that many high-debt students were motivated by the opportunity to obtain loan-forgiveness by serving in shortage areas.
2. Scholarships	Evaluations of such scholarship programs as the National Health Service Corps have not been completed and trends in retention rates have been difficult to assess. The program has not been able to staff some sites in more remote and isolated communities.

VARIABLES	MAJOR FINDINGS
E. General Background and Sociodemographic Characteristics	
1. Geographic Origin	The AAMC Longitudinal Study of Medical School Graduates found that once specialty differences are taken into account, only background characteristics, particularly the size of community lived in most of life, are significantly related to location choice (1979). Long reports several studies which have determined that physicians are more likely to locate their practice in communities whose size resembles those in which they lived prior to attending medical school (1975). Hassinger also reports that rural as well as urban primary care physicians were likely to return to practice in places similar in size to where they were born (1979). The probability of choosing a given practice location increases with the amount of prior contact, including place of birth (Yett, 1973). Hassinger found that selection of a practice site is based on preferences developed in the socialization of early years and altered through training and career experiences (1979). Weiskotten's study of U.S. medical school graduates for the period 1915-1955 concluded that all prior location factors influenced a physician's location choice (1960).

VARIABLES	MAJOR FINDINGS
I. INFLUENCES (Cont'd) E. General Background and Sociodemographic Characteristics (Cont'd) 1. Geographic Origin (Cont'd)	Yett and Sloan found that general practitioners (GPs) were substantially more likely than other physicians to practice in their States of birth (1974). About 15 percent of all physicians entered practice in their States of birth; for GPs, internists, and pediatricians the figure was 27 percent, 16 percent and 10 percent. In cases where the physician did not practice in his home State or community, attitudinal evidence indicates that preferences for community size are probably established by early types of area contact. A number of recent studies confirm the significance of place of rearing in predicting practice location (Cooper, 1975; Cullison, 1976; Cordes, 1978; Erdmann, 1979; Wilson, 1979; Wendling, 1978).
	Place of birth, however, was not significantly related to choice of practice location in either Held's (1973) or Weber's (1972) analysis.
2. Geographic: Medical School	Weiskotten indicated that more than half of the graduates in his study were practicing medicine in the State in which they resided prior to attending medical school (1960). Held reexamined the data and reported that many of the physicians also went to medical school and took residency in that State (1973). Breisch supported the hypothesis that physicians tended to locate in areas similar in size to those of the medical school they attended, but the

VARIABLES	MAJOR FINDINGS
I. INFLUENCES (Cont'd) E. General Background and Sociodemographic Characteristics (Cont'd) 2. Geographic: Medical School (Cont'd)	study was not controlled for background of students (1970). Existing evidence indicates that attending a medical school in a State without previous or later State contact had a slight impact on the propensity of graduates to practice there. (Yett, 1973). Wilson found that physicians in the non-Corps sample who are in rural areas tended to have gone to medical school in a relatively small community (1979).
3. Geographic: Residency	Weiskotten (1960), Fahs and Peterson (1968), and Held (1973) have reported that the State in which residency training was taken was more significant in predicting location choice than the State in which the medical school was located. However, Fein and Weber maintained that physicians take their residency training in the State in which they plan to practice, in order to gain helpful contacts (1971). Hadley disputed Weiskotten, reporting that his method involved double counting since the four contact events were not mutually exclusive, and that a single factor, site of residency training, has a small effect (1975). However, in combination with the other three factors (born or lived in area, medical school, internship and residency location), the influence of residency training sites was considerable. Results of a recent study in Texas indicate that the selection of a residency is closely associated with a choice of permanent

VARIABLES	MAJOR FINDINGS
I. INFLUENCES (Cont'd) E. General Background and Sociodemographic Characteristics 3. Geographic: Residency	location for practice, both of in-State medical school graduates and out-of-State graduates (Stefanu, 1979). The dominant position of the residency site among prior location factors was also supported by Petersdorf, who reported that 53 percent of specialists in the Washington-Alaska-Montana -Idaho region had obtained their training in the region (1975). However, Hassinger in Missouri found location of residency training not to be an important influence (1979). Yett and Sloan suggested that the more contact events a physician has in a State the greater the probability of his locating in the State, and that the more recent contacts appear to have a greater impact than the earlier ones (1974).
4. Geographic: First Practice	Fein and Weber inquired into another aspect of the relationship between residency training and physician's choice, and concluded that physicians take their residency training in States where they intend to establish their practice, and do not choose their practice location subsequent to residency training (1971). However, this conclusion was disputed by Yett and Sloan (1974). Hadley questions both sets of findings and concludes the causality issue has yet to be resolved (1975).

VARIABLES	MAJOR FINDINGS
5. Specialty, Age, First Practice	Harvey (1973) found that specialists who had left general practice were more likely than general practitioners to establish their first practice in a town of 49,999 or smaller. Physicians in the former group were more likely to encounter difficulty with lack of consultants and lack of hospital facilities.
6. Race of Physician	Tabulations of data on the State level location of physicians in 1967 indicated that location of black physicians were not substantially different from those of white physicians (Yett, 1973). It is commonly believed that black physicians are disproportionately likely to settle in inner city neighborhoods and to serve black patients, and substantive evidence has been advanced by Woolridge (1976), Guzick and Jahiel (1976), and Breiger (1979). In a study by Lloyd et al. (1978) 72 percent of black Howard graduates had black patients, but only a fourth were patients who were judged to be "well-to-do." There is also some indication that physicians practice in areas where there are people of their own ethnic group (Lieberson, 1958) and that preferences for ones own ethnic group maximizes physicians' income (Elesh and Schollaert, 1972).
7. Academic Ability	Few studies have related academic ability to eventual choice of practice location. However, CONSAD found that the medical student who enters general practice

VARIABLES	MAJOR FINDINGS
I. INFLUENCES (Cont'd) E. General Background and Sociodemographic Characteristics (Cont'd) 7. Academic Ability (Cont'd)	has low MCAT and medical school performance scores (CONSAD, 1973). A number of other studies have reported that graduates with the lowest MCAT scores or class standings are those most likely to enter unspecialized internships (Peterson, 1963; Perlstadt, 1972).
8. Sex	Nothing substantive is known of the practice location behavior of women, but it is suggested that a third or more of all women physicians select practice locations in concert with the decision of their physician husbands. McGrath and Zimet (1977) found a preference for family practice and internal medicine among women in two western medical schools. According to some, the impact on location decisions of these changing preferences is that more women may be expected to settle in rural areas. (Lavin et al., 1980).
9. Time of Location Decision	Some evidence indicates that specialty choice generally precedes location choice. General location decisions are not made until after graduation from medical school by as many as 75 to 85 percent of all physicians (Parker and Tuxill, 1967; Heald et al. 1974; Hassinger, 1963) Physicians brought up in rural areas tend to make earlier location choices than those from urban areas. Results from Heald's 1965 survey of medical school graduates concluded that 73 percent of all physicians and 68 percent of primary care physicians who responded to the survey

VARIABLES	MAJOR FINDINGS
I. INFLUENCES (Cont'd) E. General Background and Sociodemographic Characteristics (Cont'd) 9. Time of Location Decision (Cont'd)	determined their preference for community size only after medical school graduation and physicians who decided to settle in a rural area decided on a practice location sooner than those who decided to settle in an urban location (1974). Wilson's recent study of NHSC physicians as well as non-corps physicians demonstrated that eventual geographic region and practice community size was decided earlier than the eventual specialty, particularly for non-primary care physicians. Most GPs and FPs tended to decide on practice location and specialty at about the same time, and generally earlier than those in other specialties (Wilson, 1979). In another study of two entering medical school classes, 99 percent of the students knew the size of community in which they planned to practice, but only 84 percent had a specialty choice planned. (Haug et al., 1980). Only 37 percent of the latter considered their specialty choice a definite decision.

VARIABLES	MAJOR FINDINGS
II. OBJECTIVES	
A. Income Maximization	Sloan found that the average net income received by physicians in 1960 had a positive and statistically significant effect on a physicians' decision to locate, and later research has borne out this finding (1968). Fahs and Peterson (1968) and Ball and Wilson (1968) also cite income as having high drawing power for all physicians. Parker, Rix and Tuxill found "anticipated small income" as a reason why physicians did not practice in small communities (1967). Parker and Sorensen's respondents reported that the area in which they practiced yielded too limited an income--33 percent cited this as a reason for leaving (1978). Cordes found that economic reasons such as the opportunity to acquire a financially sound practice were mentioned by almost 40% of doctors as influencing locational decisions (1978). However, Benham (1968), Rimlinger and Steele (1963) and Marshall (1971) argue that income is not as important as originally thought. Held found expected earnings to have a small effect on migration of physicians, and a tendency for migrants to be drawn toward nonpecuniary benefits and existing concentrations of physicians (1973). Rural physician's incomes are apparently not systematically lower than those of urban physicians.

VARIABLES	MAJOR FINDINGS
II. OBJECTIVES (Cont'd) A. Income Maximization (Cont'd)	Hadley also found financial variables were not significant in a physician's location choice. The physician's relative mean net income was found to be an insignificant factor, which may have been due to the lack of exact physician productivity data (1975). Wilson demonstrated that rural physicians tend to have a somewhat lower concern than other specialists about having a relatively high and/or increasing income (1979). Lave, Lave, and Leinhardt felt that physician incomes are "currently so high that the lure of still higher income influences few" (1975). Physicians, they argue, are more concerned with cultural, environmental, and professional amenities. Thus, the relative importance of income has mixed and inconclusive results in all of the studies. Limitations in the economic literature stem from lack of data, lack of consideration of important noneconomic variables, and study designs inhibiting focus on this variable. Most studies found income to have a positive and generally statistically significant impact on the number of at least some types of physicians in a geographic area. However, the magnitude of this relationship varies considerably (Hadley, 1980).
B. Family-Oriented Goals	DeVise identified four types of life-style goals motivating physicians to locate in certain States and urban centers. Family-oriented goals stressed the best

VARIABLES	MAJOR FINDINGS
II. OBJECTIVES B. Family-Oriented Goals (Cont'd)	environment for bringing up children and satisfying the social daytime needs of the mother (1973). Peterson surveyed physicians who listed lifestyle indicators as being of major importance by both urban and rural physicians (1968). Bible found that respondents who liked rural practice and living did so because of the feeling that rural people were friendly and dependable, which resulted in close personal ties (1970). Parker, Rix, and Tuxhill reported that of those physicians practicing in small towns, personal lifestyle preferences rather than professional issues predominated (1969).
C. Social Prestige	
1. Friends	Crawford and McCormack reported that of physicians who left primary practice in a small community, the social life and companions for their children were described as adequate or better than average (1971). Bible cited deficiencies in social opportunities as a major problem for physicians locating in rural areas, and the development of close and lasting friendships as a desirable factor (1970). Harvey reported that five percent of general practitioners and 11 percent of specialists' wives were dissatisfied with the kind of social and family life possible when the husband was in rural practice (1973).

VARIABLES	MAJOR FINDINGS
2. Place in Community	Bible cited several desirable factors in community life including "opportunity for community leadership (1970)." The prospect of being more influential in community affairs was cited by physicians as being relatively important in location choice, particularly for older physicians and urban physicians. It is debatable whether this factor was actually important in decision-making at the time, or if subsequent success provided a rationalization (Parker and Tuxill, 1976). Coleman described situations in which community recruitment was successful for non-GPs and found that the prospect of influence in the community was a related factor (1976). However, the opportunity to take an active part in community affairs seemed to be a minor influence in another study (Heald et al., 1974).
D. Professional Interaction	DeVise identified professional interaction as one of the four goals which motivates a physician in terms of location choice (1973). He hypothesized that this goal, stressing professional and social interaction among people sharing common skills, values and interests, favors intrastate locations accessible to concentrations of specialists' offices downtown and in large university medical centers. Parker and Tuxill cited lack of free and informal communication with medical peers (professional isolation) as a deterrent to rural practice (1967). Heald et al. found that

VARIABLES	MAJOR FINDINGS
II. OBJECTIVES (Cont'd) D. Professional Interaction (Cont'd)	among the factors cited most frequently by recent graduates were opportunity for regular contact with a medical school or medical center and with other physicians (1974). Bible surveyed physicians in nonmetropolitan areas and found that opportunity for professional growth was considered a problem but this varied with the size of the community (1970). The GAO study demonstrated that of the physicians they surveyed, five of the seven top factors related to clinical support, contact with other physicians and continuing education (1977). An opposing viewpoint was proposed by Ducker, who in a more recent study, found that for 46 physicians practicing in nonurban areas, professional isolation was not a major problem (1977).
E. Practice 1. Work-Leisure	Established rural physicians are more likely than urban physicians to complain of excessive workloads, irregular hours, the demands of being continuously on call, and the availability of little leisure time. Parker and Sorensen cite too large a workload and inability to get adequate time off as reasons physicians do not practice in small communities (1978). Hassinger reported that a confining work situation (inability to get away from patients) was a disadvantage reported by a substantial proportion of rural M.D.s and D.O.s (1979). Crawford and McCormack (1971) found that the greatest complaint offered by primary practitioners in rural

VARIABLES	MAJOR FINDINGS
II. OBJECTIVES (Cont'd) E. Practice (Cont'd) 1. Work-Leisure (Cont'd)	areas was overwork. At least two-thirds gave this as a major reason for leaving practice. The vice-president of the Sears-Roebuck Foundation stated that, in some cases, a physician who came to a town that was doctor-short "wouldn't have enough work during the days to keep busy, and then he'd spend half the night taking care of emergencies." (Lavin, 1972). Riley et al. (1969), Bible, 1970, and Taylor et al. (1973) reported that physicians believe long hours and disruptions of family life are drawbacks of rural practice. Hambleton found that at the State level specialists appear to be most concerned about the use of their leisure time. At the county level the costs of using leisure time were still dominant in the decision of a specialist to locate. Although the strongest force was the availability of a general hospital, the next most important was locally developed recreational sites (1971). Harvey disputed these arguments, claiming that physicians leave general practice for two reasons: the kinds of value orientations they hold and medical competence (1973). According to Shannon and Dever, the desire for leisure is apparently not a strong motivating force in physician's choice of location (1974). Recent research indicates that rural physicians have a lesser aversion than urban physicians to long hours and seeing large numbers of

VARIABLES	MAJOR FINDINGS
II. OBJECTIVES (Cont'd) E. Practice (Cont'd) 1. Work-Leisure (Cont'd)	patients each day (Ducker, 1977; Wilson, 1979). Parker and Tuxill (1967) found that 85% of the urban respondents claimed that long hours were an important factor in other physicians location decisions, but less than 30 percent were influenced themselves.
2. Patient Case Mix a. Interesting b. Quality of Care c. Challenge, Independence	Parker and Tuxill (1967) found that one of the factors which deterred a significant number of physicians from locating in a small community was the notion that medical care might not be of the quality found in large medical centers; one factor likely to influence physicians to locate in a small community was "challenge of practicing in a rural area lacking complete facilities." Crawford and McCormack (1971) found that no one described boredom or lack of a challenge as a reason for leaving primary practice, but the physicians were concerned about the quality of care they were able to give. Physicians who report that professional considerations predominate cite the ability to have a varied practice as associated with urban practice (Lave et al., 1975). Harvey found that important factors involved in the decision to leave general practice are "spectrum of problems faced in general practice too broad" and "unreasonable expectations on the part of patients." (1973). Lave, Lave, and Leinhardt report that physicians seem more concerned with factors such as interesting case variety which are

VARIABLES	MAJOR FINDINGS
II. OBJECTIVES (Cont'd) E. Practice (Cont'd) 2. Patient Case Mix a. Interesting b. Quality of Care c. Challenge, Independence	usually associated with large populations (1975). Wilson (1979) and Hassinger (1979) found that rural practitioners clearly value the attributes that typify general medical practice including variety in procedures and techniques that they are called upon to employ and close interaction with patients, while metropolitan physicians tend to emphasize the technical side of medicine.
3. Physician-Patient Relationship	Physicians dissatisfied with rural practice cited "the attitude of inhabitants of small communities toward physicians bent on performing complete and extensive studies" as affecting their ability to feel comfortable. (Parker and Sorensen, 1979). Also cited was distrust of the abilities of the doctor by many small communities. Physicians happy with rural living preferred the closer ties to patients, their activities and problems (1979). For rural physicians in Hassinger's study, the advantage most often cited was the quality of the doctor-patient relationship (1979).
F. Personal (Lifestyle)	There is a large body of data suggesting that lifestyle preference is an important criterion in practice location (Bible, 1970; Cooper et al., 1972; Taylor, 1973; Coleman, 1976; Hassinger, 1979).
1. Geographic Area Preference	Seventy-four primary physicians in group practice were queried as to why they decided to work in their present organization. The majority said the community and

VARIABLES	MAJOR FINDINGS
II. OBJECTIVES (Cont'd) F. Personal (Lifestyle) (Cont'd) 1. Geographic Area Preference (Cont'd)	the general geographic location of the group was unimportant to their decision (Madison, 1971). Parker and Tuxill found that one of the three most important factors for locating in a small community was the idea of small community living (Parker and Tuxill, 1967). A later study by Parker and Sorensen found that a predisposition to small community living is essential for physicians to be recruited for rural practice (1978). The most frequently cited reason for physicians choosing to practice in their present community were "personal preference for the general area and/or this type of community" in the Cordes study (1978). The advantage most commonly reported by rural physicians was their general preference for rural areas, and they often cited their rural background as a basis (Hassinger, 1979). Bible found that one of the three most frequently mentioned influences on physicians was geographic preference (Bible, 1970). A GAO report concluded that rural physicians generally were more influenced by preference to live in a rural or a particular geographic area. (GAO, 1978).
2. Desire to be of help	One factor that influenced 73 percent of physicians in Parker and Sorensen's study was "need for physicians in your community" (1978). Concern with an area's medical needs was also found by Wendling et al. to be an

VARIABLES	MAJOR FINDINGS
II. OBJECTIVES (Cont'd) F. Personal (Lifestyle) (Cont'd) 2. Desire to be of help (Cont'd)	explanatory variable at the national leve land in the regions they studied (1978). GAO found rural physicians more influenced by the high medical need in an area (GAO, 1978).

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS	
A. Environment	Virtually all conceivable aspects of living conditions have been reported as of moderate to major importance in location decisions.
1. Culture	The availability of "cultural resources" is reported by most investigators to be a highly significant determinant of location choices, but the types of resources have not been identified and the meaning of the term is not precise (Yett, 1973). Parker and Tuxill found that approximately 80 percent of physicians rated "possible scarcity of cultural events and places of entertainment" as factors deterring them from practicing in a small community (1967). Schaupp rated "acceptable social and cultural environment" as one of the three most important factors in location choice (1969). Crawford and McCormack found that communities with a profile of deficiencies in physician numbers have inadequate cultural resources (Crawford and McCormack, 1971; DHEW, 1974). Cooper et al. noted that urban physicians feel that opportunities for social life and cultural advantages are important factors (1975). Hassinger reported that lack of cultural activities ranked highest among disadvantages reported by rural physicians.

VARIABLES	MAJOR FINDINGS
III. DECISION FACTORS (Cont'd) A. Environment (Cont'd) 1. Culture (Cont'd)	Although it is Yett's subjective impression, this disadvantage was a cliche among rural doctors and did not appear to be serious (1979)
2. Recreation	The extent of a community's recreational facilities somehow appears to affect the geographic distribution of specialists, but not of GPs (Martin, 1968; Hambleton, 1971). Hambleton pinpointed certain indicators of leisure time activities--public beaches/campsites, tennis courts and recreational spending--as exerting a strong influence on the State location of specialists, but less so on the county. Bible found that avocational opportunities such as hunting or fishing were considered desirable attractions of a small community (1970). Hassinger reported that the disadvantage "too far from recreation" (water sports and skiing) was cited almost exclusively by metropolitan doctors (1979).
3. Housing:	McFarland listed housing as a factor in location decisions which is an inefficient policy variable (not subject to manipulation) (1972). Shannon and Dever state that the most important considerations for site selection seem to be the availability of housing and equipment (affecting costs of settlement) as well as other professional considerations (1974).
4. Community Security:	McFarland also listed community security as a factor in location decisions which is not subject to a great deal of policy manipulation

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd)	
A. Environment (Cont'd)	
4. Community Security: (Cont'd)	(1972). Wilson found rural physicians had a preference for living in the same community as one's patients and being safe and secure (1979).
5. Transportation:	McFarland also cited intra-regional transport as a policy variable not subject to a great deal of manipulation (1972). Thirty-two percent of physicians cited "distance to hospital" as a liability in isolated rural counties as opposed to 12 percent in metropolitan areas (Bible, 1970). Physicians listed less traffic and confusion as assets of rural practice (Bible, 1970). Sixteen percent of respondents to Parker and Sorensen's study found the distance from their office to the hospital they used was too great, and this was the reason for their leaving a rural community (1978). Wilson demonstrated that rural physicians preferred rural practice because they avoided a lengthy commute to the office (1979).
6. Schools:	Bible found that one of the factors pertaining to community living which was of concern was the limited availability of educational facilities (Bible, 1970). It was reported that the quality and accessibility to primary and secondary education is an important consideration in location plans (Charles, 1971; Long, 1975; Yett; 1973). Crawford and McCormack studied physician satisfaction with aspects of rural life and found that schools were described

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) A. Environment (Cont'd) 6. Schools (Cont'd)	as adequate or better. (1971) Schaupp found that of the three most important factors in location choice, availability of good education facilities for children ranked first (1969). In a study comparing Appalachian rural physicians with those practicing in Knoxville, Champion reported that urban educational facilities were important for physicians with school age children (1971). The data suggest that perceptions of characteristics of schools may be influential; that is, desirable characteristics need not attract physicians but undesirable ones may keep them away. In sum, the quality of community life, including educational opportunities, appear to influence the physician in his choice of location (DHEW, 1974).
7. Pollution:	McFarland lists pollution as an environmental variable which affects location decisions but allows for little chance of policy correction. (McFarland, 1972).
8. Shopping:	Also listed under environmental, quality of life, nonprofessional attractions of community life is access to shopping (McFarland, 1972). Crawford and McCormack found that shopping facilities appeared to be adequate for rural practitioners in his study (1971). Dewey studied data for 1950, 1960 and 1970 and observed that suburban shopping centers and office buildings had high attractive potential for physicians (1973). The general

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) A. Environment (Cont'd) Shopping (Cont'd)	pattern of migration over recent decades has been from colder to warmer sections of the country.
9. Climate:	The climate of an area, its geographic features, or both, are generally ranked among the two or three most influential of all professional and personal factors (Fein, 1956; Charles, 1971, Roleston, 1973; Heald et al., 1974; Steinwald and Steinwald, 1974, Longnecker, 1975). In one small-sample study, Schaupp (1969) found climate preferences to be an unimportant decision factor to graduates of West Virginia, but in another study Martin et al., (1968) reported that they strongly affected the decisions of Kansas graduates to leave or remain in the State. Physician-population ratios are reported to be significantly correlated with climate (Yett and Sloan, 1974; Martin, 1968; Coleman, 1976). DeVise reports that an examination of the ten States with the "highest physician-population ratios confirms the strong attraction that East and West coast centers of glamour and good climate exert on physicians." (1973) Long states that the best established results are that "on the average, physicians are attracted to regions having warm winter climates." (1975) A 1972 survey of 1,965 medical school graduates found that life-style factors such as climate, were among the major ones listed in location decisions (Steinwald and Steinwald, 1974). The

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) A. Environment (Cont'd) 9. Climate (Cont'd)	Illinois Board of Education found that climate was reported as being the prime reason why physicians left the State (IOM, 1976). Wilson found physicians who were in undesirable National Health Service Corps sites were retained in that site if they were tolerant of adverse climatic conditions (1979). Unfortunately, no substantive attempts have been made to determine what types of climates or geographic characteristics physicians prefer. This limits the value of attitudinal evidence for specifying and testing hypotheses concerning the effects of climate and geography on location behavior.
10. Population Growth: Change	Factors relating to community living which were of considerable concern to respondents of Bible's survey included lack of a growing and thriving community (1970). New physicians have been reported to be attracted to areas characterized by recent population growth (Rimlinger and Steele, 1976). Using State data, Fein and Weber found that population growth was the most important single factor accounting for the variation in number of new physicians locating in each State (1971). Rimlinger and Steele found, however, that an increase in population is only effective in attracting physicians to urban, not rural areas. Mountin, Pennell and Brockett found that population growth must be accompanied by high income (1945).

VARIABLES	MAJOR FINDINGS
11. Economic Growth:	Smith supported the general hypothesis that physicians prefer to locate in stable economic areas (1961). Sloan corroborated this by finding that physicians tend to locate in areas subject to less cyclical variations in income (1968). Fahs and Peterson found that 64 percent of "no-physician" towns had a decline in economic growth rates (1968).
12. Urbanization: Population Density a. Proportion of Population - Agriculture	Parker, Rix and Tuxill found that areas with a relatively high percentage of the population engaged in agriculture and with a low percentage of high school graduates are disadvangated in attempts to attract and retain physicians (1969). Several studies have noted that urbanization also had significant effects on physician location, although the separate influences of per capita income and urbanization are difficult to determine (Steele and Rimlinger, 1963; Benham, 1968; Hambleton, 1971). Joroff and Navarro (1971) and Scheffler (1971) explained large differences in physician distribution by local differences in population (as well as affluence and medical school production). Benham found that physicians are more responsive in their location choices to the size of the population than to its per capita income (1968). Kane (1979) stated that a less remote rural area having a higher population density is less likely to be deficient in health personnel. Bible cites Rix's emphasis on the accelerating influence of urbanization during the past few decades in

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) A. Environment (Cont'd)	attracting young physicians to locate in larger centers of population. (Bible, 1970)
12. Urbanization: Population Density(Cont'd) a. Proportion of Population - Agriculture (Cont'd)	Marden concluded that population size is significantly and positively associated with the distribution of private practitioners (1966). Evashwick found population density to be salient in explaining physician location in 1960 and 1970 (1976). Yett and Sloan demonstrated that the percent of the State's population residing in Standard Metropolitan Statistical Areas proved to be significant in one of two cases relating to specialists, and in the case of general practitioners the data indicated that they are attracted to less densely populated areas. (1974) Wilson found critical values on certain community characteristics, such that above the critical value the characteristic becomes important. Having a county-wide population density of 10 persons per square mile or less was one such characteristic (Wilson, 1979).
b. Proportion of Population Professional	According to the Human Resources Research Center, there are some indications that, on the average, GPs choose relatively poor and elderly populations, while non-GPs locate in areas of relatively high educational attainment (Yett, 1973). Since urbanization as an independent variable suggests no

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) A. Environment (Cont'd) 12. Urbanization: Population Den.(Cont'd) b. Proportion of Pop. Professional(Cont'd)	policy initiatives, the effect of preference for urban areas by physicians should be examined in the context of urban-rural distribution, and in the light of characteristics of urban-rural areas that attract or repel physicians.
13. Racial Mix	Cooper, Heald, and Samuels maintain that the influence of family and friends as it appears in survey responses may be a surrogate for ethnic or racial concerns of physicians (1972). Lieberson concluded that the desire to maximize income appears to be a consideration for physicians to locate among their own ethnic groups (1958). Elesh and Schollaert found that race produces an 18 percent difference in the number of physicians between black and white census tracts (1972). Physicians "do avoid practice in black areas, and the avoiders are chiefly general practitioners." (Elesh and Schollaert). Researchers do not agree on the importance of race as a determinant of intraurban practice locations. Hambleton concluded that more physicians' offices were located in postal zones with a large black population (Hambleton, 1971). Elesh and Schollaert found that physicians did not locate their offices in areas with a large black population. However, in a study of census tracts in Brooklyn, New York, race was not found to be an important variable (May, 1970). Wilson demonstrated

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) A. Environment (Cont'd) 13. Racial Mix (Cont'd)	that having a county-wide non-white population greater than 20 percent of the total was related to retention in National Health Service Corps sites (1979). Non-white physicians were somewhat more likely to be retained in the site community under these circumstances.
14. Wealth of area (see also IIA-Income (Maximazation, IIIC 1e Per Capita Income, and III C2 Physician Income in Area)	A number of reports have concluded that physicians tend to locate in high income areas, but the relative importance of income varies (Rimlinger and Steele, 1965; Sloan, 1970; Fein and Weber, 1971). According to several studies, high income areas offer a wide variety of attractive features that may operate independently to attract physicians (Long, 1975). Benham et al., conclude that effective demand for physicians' services within a State depends on per capita income after population (1968). Hambleton's analysis shows that per capita income was the most important influence in the choice of practice location of general practitioners, but had little influence on a specialist's decision (1971). Ball and Wilson, on the other hand, found that "effective buying income" was a more relevant factor in the location of specialists than in the location of general practitioners (1968).

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) A. Environment (Cont'd) 14. Wealth of area (see also IIA-Income (Maximization, IIIC 1e Per Capita Income, and III C2 Physician Income in Area) Cont'd)	Cooper cites the economy of the community as an important determining factor in location choice (1972). "Towns with low median income or an otherwise poor economy are in an unfavorable position for attracting or retaining physicians." Forty-two percent of physicians were influenced to settle in a small community because it was a "prosperous part of the country" (Parker and Sorensen, 1978). Wilson found a county-wide median family income of $8,500 or less negatively related to retention in a National Health Service Corps site (1979). In summary, area wealth affects the location of physicians either because high income induces relatively high demand for physicians services, thus creating attractive practice opportunities, or because high income areas are otherwise attractive to physicians because of their professional, social and cultural environments (Yett, 1973).
15. Size of Community	When Benham examined the absolute number of physicians across geographic areas, population size emerged as the single most important determinant of the physician supply (1968). In a Kansas study, population size of counties was also reported to be the most important factor in determining physician location (Marshall, 1971). Fahs and Peterson found a clear relationship between a town's population and its physician status. In the States and towns he studied, 187 had no physician, but of those only four had a population

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) A. Environment (Cont'd) 15. Size of Community(Cont'd)	greater than 1,000 (1968). Joroff and Navarro, on the other hand, found population not an important determinant of variation in physician-population ratios (1971). Marden's analysis of 204 SMSAs and 165 cities found population size to have a strong effect, but other factors were not held constant (1966).
16. Terrain	Thirty-five percent of respondents cited climate or geographic features of an area as the first ranked factor in location decisions (Cooper et al., 1975).
17. Religion	Although some research has been done on religious background by specialty, the relationship between religious background and location choice has not been studied (Yett, 1973). There are indications that non-religious and Jewish physicians are disproportionately likely to choose psychiatry, academic medicine or internal medicine (Kritzer and Zimet, 1967). These choices may dictate location choices. Parker and Sorensen recorded comments by physicians regarding religion including the following: "there is . . . the realistic notion that in this still religion-conscious country minority groups may find limited acceptance in smaller communities as well as limited religious facilities" (1978).
18. Population Mobility	Areas with low population mobility are disadvantaged in attempts to attract and retain physicians (Parker, Rix and Tuxill, 1969).

VARIABLES	MAJOR FINDINGS
19. Relocation and Search Costs	It is assumed that if a physician chooses a more populous area, he can rely more on information supplied by pharmacists, bankers, his medical school and other doctors, reducing the costs of his search. One of the most important considerations for site selection seems to be the availability of housing and equipment, which affect the costs of settlement (Shannon and Dever, 1974).
20. Welfare Support	The availability of good social services, welfare, or home care services was found to be a nonsignificant factor in Cooper et al.'s, regression analyses of primary care physicians in urban areas (1975). However, for rural areas, good social service or welfare agencies were much more important.
21. Zoning	Kaplan and Leinhardt noted that census tracts with small amounts of commercial zoning do not seem to attract physicians. It is only when a tract has a major amount of commercial activity that large concentrations of physicians exist (1973). Elesh and Schollaert studied census tracts in Chicago and found that percent commercial and in the tract had a positive and significant coefficient in the all physicians, general practitioner and specialist equations (1972).
22. Public Services	McFarland lists the provision of public services as an environmental variable affecting location choices which is an inefficient policy variable (1972). Sloan found that physician-population

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) A. Environment (Cont'd) 22. Public Services (Cont'd)	ratios were significantly correlated with State and local public service expenditures (Sloan, 1968).
B. Practice Related 1. Availability, Quality and Quantity of Hospital Services	A large number of studies have dealt with the question of the availability and proximity of hospital services as a major determinant in physician location. (Parker and Tuxill, 1967; Bible, 1970; Charles, 1971; Heald et al., 1974) The availability of hospitals is said to attract physicians since nearly all physicians need hospital privileges in order to practice. Explanatory variables have included the number of hospital beds, the number of beds per capita, the number of hospitals in the area, and the percentage increase in the number of hospital beds (IOM, 1975). One study supported by the Human Resources Research Center found a weak relationship between the total number of physicians, or total physician-population ratios, and hospital capacity. They found a strong positive relationship between the number of specialists and hospital capacity. No cause and effect relationship between hospital capacity and physician location was demonstrated. They concluded that the role of the hospital in location decisions is exceedingly complex (Yett, 1973). A number of studies indicate that the hospital bed rate is an important predictor of the location of some specialties, although not of general practitioners.

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd) 1. Availability, Quality and Quantity of Hospital Services (Cont'd)	(Joroff and Navarro, 1971, Reskin and Campbell, 1974; Yett and Sloan,1974). Marden, on the other hand, found the hospital bed rate had little influence on the location of specialists, especially in small cities; he reported more GPs in those metropolitan areas having fewer hospital facilities (1966). Other studies indicate that the existence of hospital facilities in a rural area will tend to draw physicians to that area (Williams and Uzzell, 1960; Royce, 1972). Bible's survey of physicians revealed that the "best opening when ready to practice" included availability of medical facilities. About half the respondents gave this as the most important factor in decision location, in addition to geographic preference (1970). Parker and Sorensen found that 82 percent of physicians named "a good community hospital" as a factor that influenced a physician to settle in a small community (1978). Champion and Olsen, in a survey of Appalachian physicians, found that the most frequently cited disadvantage of medical practice was lack of facilities such as hospitals and equipment (1971). Shannon and Dever cite a study which shows a strong negative association between GPs and hospitals: A decrease of 5.4 for every new hospital per 100 square miles (Hambleton, 1971). In urban areas Kaplan and Leinhardt found that if 100 hospital beds are

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd)	added to a census tract it would, on the average, increase physician offices in that tract 2.6 and increase offices 1.2 in neighboring tracts (1973).
1. Availability, Quality and Quantity of Hospital Services (Cont'd)	Yett summarized the results of several studies indicating that at the State and county levels, the number and number per capita of nongeneral practitioners was very positively associated with the area's hospital capacity, whereas the number of general practitioners was not. The implication is that hospitals attract referral specialists, but exert a much weaker influence on most primary care practitioners. Data also indicate that internists produce substantial percentages of their total patient visits in hospitals, and, among the primary care specialists, internists are probably relatively more attracted to those areas having the most hospital capacity. In cities, evidence suggests all physicians are attracted by the proximity of hospitals (1973).
2. Availability of Ancillary Services (Laboratory, pharmacy, x-ray, office)	About 90 percent of large and small community physicians surveyed said that the notion that smaller communities lack complete facilities was an important deterrent to locating there (Parker, Rix, and Tuxill, 1976). Champion and Olsen reported that when asked to identify deterrents to Appalachian practice, physicians most frequently cited the inadequacy of general medical "paraphernalia"

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd)	and medical facilities. Lack of medical facilities was also cited in Bible's survey (1970).
2. Availability of Ancillary Services (Laboratory, pharmacy, x-ray, office) (Cont'd)	On the other hand, Ducker, in a more recent study, found that 84 percent of physicians sampled in rural areas expressed satisfaction with their office facilities (1977).
3. Availability of Personnel	Attitudinal and interview studies indicate the availability of clinical support personnel may affect physicians' location choices, although it is probably more important for non-general than general practitioners. The Institute of Medicine stated that the availability of supporting health personnel may influence the location decisions of physicians, but investigations into this relationship are too "sparse and research results too ambiguous to warrant reporting" (IOM, 1975). Physicians were reported not to be satisfied with their current practice in a rural area because of a shortage of physicians and allied health personnel (Bible, 1970). McFarland lists "allied health personnel" as a professional relationship factor which is a potential policy variable affecting location decisions. Lack of support personnel was almost exclusively reported by rural physicians in Hassinger's study (1979).
4. Availability of Medical Schools	A substantially higher per capita concentration of physicians, especially specialists, is found in areas having medical

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd) 4. Availability of Medical Schools (Cont'd)	training centers (Coleman, 1976). While this concentration may be attributed to the attraction of technical knowledge available there, it is difficult to separate this effect from that of urban amenities (Shannon and Dever, 1974). Joroff and Navarro report more conclusive results: The number of medical schools was the single most important predictor of the location of eight specialties (1966). Scheffler also found this to be a factor (1972). Parker and Sorensen found a medical center nearby to be a factor influencing physicians to settle in a small community (1978). Heald, Cooper, and Coleman (1974) also concluded that among the most important factors in choice of location were opportunity for regular personal contact with a medical school or medical center. According to Ball and Wilson (1968) and Yett and Sloan (1970), the existence of medical schools in an area increases the physician supply because it creates opportunities for practice, particularly for specialists. The existence of a medical school is thought to create an environment that makes the area attractive for medical practice. Medical schools are the focus of professional interaction, provide opportunities for continuing education; and otherwise serve as a magnet for physicians (Long, 1975). Thus, nearness to a medical school has been reported to be a moderately influential factor, but less important to primary care physicians than to

VARIABLES	MAJOR FINDINGS
	referral specialists. (Fein, 1956; Charles, 1971).
5. Availability of Consultations	Bible's survey of nonmetropolitan physicians indicated that they were concerned with the limited availability of medical facilities and consulting services (Bible, 1970). Attitudinal findings indicate that some physicians seek areas where they have opportunities for contact with professional colleagues (Yett, 1973). Although there are competitive forces leading physicians to choose areas with low concentrations of established physicians, there are other forces which lead them to prefer areas allowing ample contact with other physicians (Yett, 1973). Heald, Cooper, and Coleman cited opportunity for regular personal contact with other physicians as an important factor for the 1,161 physicians they studied (1974). A recent study by Ducker reported that only 37.5 percent of physicians sampled were satisfied with their opportunities for professional contacts in a rural practice (1977). A survey by Parker and Sorensen in 1978 revealed that 49 percent of physicians who left rural practice did so because they were unable to rely on the physicians in that medical community for much professional support (Parker and Sorensen, 1978). In the GAO study physicians indicated that if access to continuing education and consulting physicians had been available, they would not have rejected shortage

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd) 5. Availability of Consultations (Cont'd)	area locations (1977). Parker and Sorensen's report on personal comments as a result of four surveys of physicians provides this summary: "It is apparent that new physicians are dependent on colleagues, a good community hospital, consultants, and a medical center in a nearby city." On the other hand, recent research also suggests that rural physicians tend to adapt to a limited scope of supporting services and facilities. This involves a shift in attitudes and values (Ducker, 1977). Wilson also reported that rural physicians seem to have a somewhat lower concern than other specialists with consultations (Wilson, 1979).
6. Emergency Medical Services	Bible noted that one of five factors in which there was a significant difference between the rating of respondents in the more populated rural counties and the isolated rural counties was "facilities for handling emergencies." (1970).
7. Licensure	The hypothesis that physicians will be attracted to States with low failure rates on medical licensure examinations was supported by Benham (1968). Scheffler found a significant negative coefficient in four years and a significant positive coefficient in one year out of twelve in his physicians per capita equation. It was suggested that a positive coefficient may indicate that the licensure variable measures quality (1971). On the other hand, several

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd) 7. Licensure (Cont'd)	studies found the failure rate on the State licensure examination is predicted to negatively affect a State's supply of physicians (Rimlinger and Steele, 1963; Sloan, 1968; Yett and Sloan, 1970). It should be pointed out that the effect of licensure restrictions should be strongest on the locational behavior of new physicians rather than on the total physician supply in a State (Long, 1975). There is indirect evidence that State board policies toward foreign medical graduates are not uniform, and that disparities in licensure policies partly account for the maldistribution of foreign graduates at the State level (Yett, 1973).
8. Group Practice Possibility	Group practice opportunities can attract physicians to rural areas (Cantwell, 1975; Charles, 1971; Heald, 1974). Over time, non-metropolitan areas that have a relatively high percent of physicians in group practice do better in maintaining and increasing their supply of physicians (Evashwick, 1976). Cooper et al., in a mail survey of all 1965 medical school graduates, found that 75 percent of new physicians prefer group practice (1972). Other researchers found the availability of group practice to be an important policy variable (Bible, 1970; Steinwald and Steinwald, 1975; and McFarland, 1972). Steinwald and Steinwald found that, overall, 57 percent of all graduates indicated that opportunity to join a desirable group practice or partnership was

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd) 8. Group Practice Possibility (Cont'd)	of prime importance in location decisions (1975). There is some evidence that multi-specialty groups in rural areas have the potential to act as medical "magnets" for doctors who desire fewer management duties and earlier economic returns in addition to colleague support (Kralewski and Luke, 1979). Since most group practices are in urban areas, it would seem that urban group practice would be easier to join. There are likely to be more nonindigent patients who have readier access to transportation (Cooper et al., 1972). Since rural communities are typically too small to support group practices, the implication is that preference for group practice is leading them to avoid rural locations. Rural physicians have often been solo practitioners, and they commonly report that rural practice would be more attractive if coverage were available. The disadvantage of solo practice was cited by 15 percent of the rural M.D.s in Hassinger's study (1979). Thus, there are some indications that established group practices are attractive to physicians not otherwise discouraged from rural practice, but the evidence is mainly qualitative (Yett, 1973) and often contradictory (Coleman, 1976). For example, Coleman found group practice not to be related to the urban-rural choice for any of the three specialty groups. Interest in group practice opportunities

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd) 8. Group Practice Possibility (Cont'd)	was more strongly related to a desire for amenities than to professional interests. Wilson found rural physicians preferred solo or small group practice (1979). Cotterill and Eisenberg concluded that general factors which affect location decisions of all physicians also affect the decisions of physicians to join groups (1979). They also demonstrated that group practice in general does not overcome the inhibiting effects of isolation nor any of the perceived disadvantages of medical practice in rural areas. The feasibility of subsidizing groups as a device for attracting physicians into rural communities is not yet fully established.
9. Contact with Other Professionals	About 43 percent of physicians sampled by Parker and Sorensen found that they were not able to obtain the professional and educational opportunities they desired in a small community (1978). Thirty-nine percent said there were too few peers to relate to socially and intellectually. About 40 percent of large community physicians interviewed by Parker and Tuxill cited the possible scarcity of nonmedical intellectual companionship as a deterrent to small community practice (1967). Over 60 percent of small and large community physicians felt it to be an important deterrent in general. Bible observed that liabilities in rural practice were limited social activities and opportunities for

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd) 9. Contact with Other Professionals (Cont'd)	professional growth (1970). McFarland noted that professional relationships were an important aspect of a satisfying professional life (1972). Cooper et al., found a positive relationship between the educational level of the community and number of specialists with the ability to attract physicians (Cooper, 1972).
10. Continuing Education Possibilities	It should be noted that professional factors are usually linked together as a set: Medical school contact, the presence of physician specialists, and continuing medical education are part of what many physicians consider a professionally desirable environment (Cooper et al., 1977). Several studies have cited access to continuing education as an important consideration in location choice (Bible, 1970; Castleton, 1970; Heald, 1974; GAO, 1977; Wendling, 1978). About 48 percent of physicians in Ducker's recent sample reported they were satisfied at some level with the opportunities for continuing education available to them. Rural M.D.s in Hassinger's study were less satisfied with opportunities for continuing education than metropolitan physicians (1979). Respondents in the Taylor et al., survey of medical students indicated that regardless of where they planned to locate their practice, they needed opportunities to keep current (Taylor, Dickman and Kane, 1973). A Rand study indicated that for two non-GP specialty groups, access to continuing education influenced

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd) 10. Continuing Education Possibilities (Cont'd)	location choice toward an urban location. Thus physicians who are unconcerned with urban "amenities" may be recruitable to rural areas by an improvement in the professional environment (Coleman, 1976). McFarland lists opportunity for continuing education as a potential policy variable affecting location decisions (1972). Parker and Sorensen propose that "more adequate programs of continuing education could do an enormous amount to lessen the ebb of physicians from rural America" (1978). For the practicing rural physicians, bringing them to the medical centers for continuing education may be less appropriate than bringing the medical centers to the physicians through continuing medical education (Parker and Sorensen, 1978). Despite continuing education, rural physicians are often reluctant to use new procedures and approaches because they have little opportunity to practice those skills (Owens et al., 1979).
11. Costs of Practice	McFarland lists costs of practice as an economic factor affecting geographic location (1972). Rated very low by Heald as an influential factor affecting location choice was "availability of loans for beginning practice" (1.4 of physicians percent sampled rated it 1, 2 or 3) (Heald et al., 1974). Hambleton included costs to the physician of delivering services such as rent, education and health personnel and found

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd) 11. Costs of Practice (Cont'd)	that at the postal zone level, rents and other costs of establishing a practice were one of two factors which seemed to have the most impact on practice location (Hambleton, 1971). Feldstein analyzed costs per unit of service provided, in addition to the availability of interesting cases, and found that demographic characteristics of an area may be sufficiently influential to induce a physician to locate where he otherwise might not satisfy simple profit maximization objectives (Feldstein, 1970).
12. Best Available Position, Quick Practice Start	The reasons most commonly mentioned for choosing a practice location in a 1971 survey of physicians were best opening when ready to practice and geographic preference (Bible, 1970). Forty-six percent of respondents who settled in a rural community in New York did so because "a good practice could be built up quickly" (Parker and Sorensen, 1978). An earlier study of both large- and small-community physicians revealed that one of the three most important factors influencing location decisions is the "prospect of building a busy practice earlier" (Parker and Tuxill, 1967).
13. Work with Established Physician	Parker and Tuxill found that about 40 percent of both rural and urban physicians rated "opportunity to practice with an established physician" as an important factor likely to influence small-town location choice. Large community physicians found it not

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) B. Practice Related (Cont'd) 13. Work with Established Physician (Cont'd)	to be a factor deterring them personally from rural practice (1967). Twenty-four percent of Parker and Sorensen's physicians were influenced to settle in a small community because "an older established physician needed a partner" (1978).
C. Demand Related 1. Population Characteristics a. Size of population	According to Benham, when the absolute number of physicians across geographic areas is examined, population size emerges as the single most important determinant of the physician supply (Benham et al., 1968). Marden has also shown a strong relationship between population size and number of physicians/specialists (1960). Fahs and Peterson found population very important in his study of upper Midwest States -- there appears to be a threshold population necessary to support a physician (1968). Elesh and Schollaert argue that given a community's ability to pay, cultural predisposition, and need, physicians will distribute themselves with regard to population composition. As populations increase in size, the magnitudes of the demand factors also increase and they can support more physicians (1972). New physicians are attracted to areas characterized by recent population growth, especially if it is caused by migration (Rimlinger and Steele, 1963; Fein and Weber, 1971). Although population growth is similar to population size, an increase in population only attracts physicians to

VARIABLES	MAJOR FINDINGS
III. DECISION FACTORS (Cont'd) C. Demand Related (Cont'd) 1. Population Characteristics a. Size of population (Cont'd)	urban areas (Rimlinger and Steele, 1963), and population size of urban areas is positively correlated with the location of various groups of specialists but negatively correlated with GPs (Yett and Sloan, 1974). Although population size and growth are important determinants of numbers of physicians, it is analysis of the variation in the number of physicians relative to population (per capita) that is not affected by size and growth (Long, 1975). While it is the single most important determinant, there is a significant amount of variation left unexplained by population variables per se (Long, 1975).
b. Age of Population	Some studies have shown that percentage of the population 65 years and older is a significant factor in the location choice of general practitioners, whereas a high level of education in the community favorably affects specialist's locations (Marden, 1966; Joroff and Navarro, 1971). Coleman found percent over 65 to be related to the physician/population ratio for both primary and non-primary care physicians (1971). Concentration of the population in very young and old age groups positively affects morbidity, and thus the age composition of the population affects demand for physician's services and through demand, affects supply, (Long, 1975). Evashwick found a positive relationship between the physician/population ratio in 1960 and the percent of the population over

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) C. Demand Related (Cont'd) 1. Population Characteristics (Cont'd) b. Age of Population (Cont'd)	age 64. This could be interpreted as an index of the amount of demand for medical services or an index of the economic growth stage of an area. However, she found that by 1970 the relationship had disappeared, indicating that physicians had left, retired or died (1976). At the postal zone level, specialists seem to be associated with the percentage of elderly population; a one percentage point increase in the proportion of the population over age sixty-five results in a gain of 24.5 specialists per 100,000. This could be due to the tendency of specialists to practice in the commercial centers of cities . . . "where many elderly reside" (Hambleton, 1971). Elesh and Schollaert found that percent of the population 25 years + had a positive and significant coefficient in the all physician, GP and specialists equations, (1972); however, the variable chosen is not very specific to young or old age (Cantwell, 1975). Yett (1973) concludes that "there are some indications that, on the average, general practitioners choose locations where the population is poor and elderly. Disparities exist among the findings, and the conclusions are best regarded as hypotheses." (1973). Guzick and Jahiel found that only elderly general practitioners show significant estimates with respect to the population over age 65 (1976). Since GPs tend to be older than specialists, it is possible that

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) C. Demand Related (Cont'd) 1. Pop. Char. (Cont'd) b. age of pop. (Cont'd)	the difference in elasticity of location estimates with respect to age 65 + is more tied to physician age than specialty status (Guzick, 1976).
c. Sex of population	Reskin and Campbell looked at several variables, including percent of the population female, and found all to be correlated with the residuals from the number of physicians on population regression equation (1974). Cantwell suggests that other covariant factors were not held constant (Cantwell, 1975). The proportion of the population of women 15-44 should be associated with the distribution of physicians because due to childbearing, these women have special medical needs. (Reskin and Campbell, 1974). Marshall et al. also looked at the percent of women 15-44 but did not find this factor a determinant of physician location (1971). McFarland lists sex as a demand determinant not subject to policy manipulation (1972).
d. Race of Population	Elesh and Schollaert found percent black in census tracts in Chicago to be negative in the general practitioner (GP) and specialist equations but significant in the GP (1972). Most black, inner-city areas are characterized by low physician/population ratios and, over time, a gradual decrease in the number of GPs accompanied by an increase in population (Roemer, 1966; McMillan et al., 1970; Robertson, 1970). Kaplan and Leinhardt, on the other hand, confirmed findings that physicians

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) C. Demand Related (Cont'd) 1. Population Characteristics (Cont'd) d. Race of Pop. (Cont'd)	do not consider race as an important determinant in their decision to locate their offices within a city (1973). Joroff and Navarro also found race not to be a significant explanatory variable (1971). Marden had similar findings but his data suggested that the distribution of GPs is affected by age and race characteristics of the population (1966). Guzick and Jahiel found that office location of non-white and/or non-American physicians tends to be associated with areas having a population that is ethnically similar to them (1976). Hambleton found that a one percentage point increase in the non-white population increases the specialists' population ratio by 3.2. This "could be due to the tendency of specialists to practice in the commercial centers of cities near black neighborhoods" (Hambleton, 1971). It should also be noted that not only do racial groups vary in average personal income, and as a consequence in their demand for medical care, but racial groups are characterized by distinctive tastes that affect their demand for medical care (Marden, 1966). It appears that low levels of effective demand for physicians' services in certain neighborhoods, rather than racial composition as such, may discourage physicians from settling in them (Yett, 1973). Patients prefer to be treated by physicians of the same ethnic origin, and physicians locate in response to the income opportunities created by these demands (Yett, 1973).

VARIABLES	MAJOR FINDINGS
	Additional research is needed to clarify why physicians tend not to settle in ghetto neighborhoods.
e. Income (Per capita)	Fuchs and Kramer estimated physician distribution for 33 States in 1955 and found per capita income one of four important variables (1972). However, the relevant variables were so closely associated that they could not separate out the various hypotheses. Positive relationships were found between the number of physicians and per capita income at the State and county level (Weiskotten, 1960; Rimlinger and Steele, 1963; Cooper et al., 1972). In studying census tracts in Chicago, Elesh and Schollaert found that physicians located their offices in high-income areas with the implication that both poor and middle-income groups had difficulty obtaining access to physicians (1972). Sloan found the income of a population to have a positive impact on the supply of doctors (1968). Monmonier also concluded that the dominant factor in the spatial distribution of physicians is high per capita income (as well as urbanization) (1972). Parker, Rix, and Tuxill too, found that areas with low median income (as well as other sociodemographic characteristics) are disadvantaged in terms of attracting and retaining physicians. Dewey and Petto (no date), Roemer (1966) and Kaplan and Leinhardt (1973) also observed low-income areas with fewer physicians, while Guzick and Jahiel in a later study found

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd)	positive elasticities of location with respect to area income (1976).
C. Demand Related (Cont'd) 1. Population Characteristics (Cont'd) e. Income (Per capita) (Cont'd)	At the State level, Fein and Weber found insignificant correlations between change in per capita income and physician-population ratios (1967). Hambleton demonstrated a positive relationship between income per capita and specialists/GPs per 100,000. Rimlinger and Steele found high-income areas had larger numbers of physicians; this was caused by a tendency for patients to visit physicians more often, to whom they were able to charge higher fees (1965). Hambleton demonstrated that per capita income was a minor factor in determining the location of specialists among the States and within a city; however, it was related to location at the county level. High income areas offer a wide variety of attractive features that operate independently to attract physicians (Long, 1975). Confirmation is provided by a number of studies that physicians are indeed concentrated in areas of high per capita income, either because earnings opportunities are concentrated there or for other reasons. (See Coleman, 1976.)
f. Education of Population	Areas with low median school years completed and low percentage of high school graduates are disadvantaged in attempts to attract and retain physicians (Parker, Rix, and Tuxill, 1969). Joroff and Navarro found median years of education to be the most important single variable in predicting the location of five specialties

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) C. Demand Related (Cont'd) 1. Population Characteristics (Cont'd) f. Education of Population (Cont'd)	(1971). Marden had similar results, but found educational level of little importance to GPs (1966). Reskin and Campbell analyzed 22 SMSAs in 1966 and found education levels positively related for all specialties except obstetrics-gynecology, and highly correlated with number of GPs (1974). Cooper, Heald, and Samuels found educational levels correlated with number of specialists (1972). Utilization of medical services is higher among those with relatively high educational attainment, and as a result physicians are concentrated in areas characterized by high attainment (Long, 1975). Since use of specialists implies greater sophistication and knowledge about medical care, specialists can be expected to locate more responsively to a population's educational level than general practitioners (Elesh and Schollaert, 1972).
g. Morbidity and Mortality	Community health levels should be related to physician distribution (Reskin and Campbell, 1974). Employing the concept of demand, we would expect that an unhealthy population would attract medical personnel, yielding a positive relationship between physician distribution and level of morbidity. On the other hand, a strong medical presence should serve to reduce the extent of sickness within the community. This would result in a negative relationship between physician distribution and community health levels. Reskin and Campbell found a moderate,

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) C. Demand Related (Cont'd) 1. Population Characteristics (Cont'd) g. Morbidity and Mortality (Cont'd)	positive relationship between all categories of physicians and the three measures of community health. Since the relationships are positive, they conclude that the "attraction" of medical doctors to morbidity is stronger than their "effect" on health levels.
h. Health Insurance Coverage	In addition to knowledge of medical facilities, the ability to purchase care is necessary for access to the services of a physician. According to Sloan, the extent of insurance coverage (as indexed by the percentage of the population with insurance coverage) influences the physician supply in a number of ways, most particularly in its strong effect on physicians' income (Sloan, 1968). Data from other sources are incomplete but suggest that extensions of insurance coverage may not be having a desired redistributional effect (Long, 1975). Rimlinger and Steele found demand for physicians' services to be a function of income, age, sex and possession of health insurance. Demand alone, however, was not found to be sufficient explanation for the existing disparities in physician supply (1963). Parker and Sorensen's anecdotal data indicate that physicians are more satisfied in a rural practice when they are involved in a prepaid health care system, and where the patients' ability to pay is of no concern (1979).

VARIABLES	MAJOR FINDINGS
i. Per Capita Health Care Expenditures	The Human Resources Research Center study found public expenditures on physician services to be correlated with numbers of physicians, with the highest correlation for nonprimary physicians in office-based practice (Yett, 1973). In a 1972 study Fuchs and Kramer compared the expenditures rendered by physicians in private practice for three periods of time (1948-56, 1956-66, and 1966-68). They found a trend toward physicians setting up practice in more affluent areas (1972).
j. Visits, (hospital, M.D.)	According to Rimlinger and Steele, one of the factors that does influence physician location choices is number of physician visits on a regional basis (1963). Education and income have been shown to be associated with physician use rates (for data on their effect on physician location see IIIC 1 e and f). One of the variables included in Hadley's equation as a proxy for the demand for physician services was annual number of patient visits per physician; he found that visits did affect the location choice of physicians who had no prior contact in the State, and to a lesser degree who had their medical school and GME in the same State (Hadley, 1973). Thirty-six percent of Crawford and McCormack's physicians saw over 40 patients daily and two-thirds cited overwork as the reason for leaving primary practice (1971).

VARIABLES	MAJOR FINDINGS
2. Physician Income in Area	Statistical studies which relate the stock of physicians in a State to average net physician income typically show a weak or negative association between the two variables. Thus, they imply that economic motives are either secondary or negligible factors in determining the distribution of physicians (Hambleton, 1971; Hadley, 1973; Yett, 1973; Yett & Sloan, 1974). On the other hand, a few studies which have employed supply-and-demand models show a significant positive association between the number of physicians and average physician net income (Sloan, 1968). These studies did not segregate physicians by specialty, nor specify gross income as a measure of net income opportunties. On the other hand, it may be that population characteristics are more accurate proxies for physician permanent net incomes in an area than are average current net incomes. That is, if the structure of demand and supply for physician's services is changing in an area, current average income levels may reveal little of future net income trends. (Yett, 1973; Long, 1975.)
	Several recent studies conclude that income does not seem to be an important factor. Physician salaries are currently so high that the lure of still higher income influences few. (Bobula and Goodman, 1978; Institute of Medicine, 1979)
	In contrast to the hypothesis that metropolitan physicians would emphasize income as one of the more

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) C. Demand Related (Cont'd) 2. Physician Income in Area (Cont'd)	important factors in location choice, the nonmetropolitan or Appalachian physician sampled in one study reflected a greater preoccupation with income as a principal motivating factor (Lave et al., 1975). Thus, results are inconclusive concerning the relationship between income and supply. It may be that physician income is not an important influence in location choice or that studies have not been designed in a way that would permit a valid test of this relationship (Lave et al., 1975; Bobula and Goodman, 1979; Hadley, 1980).
3. Price of Area Services	The prevailing pricing practices of physicians, which are to increase fees in proportion to the income of the area, contribute significantly to the observed differences in physician-population ratios between urban and rural areas. (Rimlinger and Steele, 1963)
4. Perceived Excess Demand	According to Long, it is not demand that attracts physicians, but the "visible consequences of excess demand," such as the availability of attractive opportunities for medical practice. Indicators include areas whose existing physicians work relatively long hours, or where there has been a recent influx in population (1975). Sloan looked at the percentage of male physicians who worked over 49 weeks in 1959 as a substitute for physicians' income and rationalized that new physicians

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) C. Demand Related (Cont'd) 4. Perceived Excess Demand (Cont'd)	will enjoy attractive starting incomes in States where there is excess demand. He found that new physicians have settled in States where physicians incomes are high, or alternatively, where the proportion of physicians working over 49 weeks a year is high (Sloan, 1968). Wiggins et al. surveyed graduates of medical school from 1915-55 and found perceived demand for medical services as a general factor influencing the choice of practice location (1970). McFarland also identified excess demand as a very important variable which is a potential, but infeasible variable for policy manipulation (1972).
5. Medicaid-Medicare-Research	Research grants to medical schools constitute an important Federal subsidy to doctors--this funding favors those areas with more physicians (de Vise, 1972). Rushing found that Medicare and Medicaid provide incentives to locate in more attractive communities where there was previous unmet demand (1971). Yett states that these findings do not establish that reimbursement opportunities lead new physicians to enter high opportunity areas. The majority of physicians in his study were undoubtedly already in practice before the beginning of reimbursement programs, so that the associations reported may indicate only that total reimbursement increases with the number of physicians eligible to receive it (Yett, 1973). Bobula and Goodman point out that inability to pay for care is no longer a deterrent

VARIABLES	MAJOR FINDINGS
III.DECISION FACTORS (Cont'd) C. Demand Related (Cont'd) 5. Medicaid-Medicare - Research (Cont'd)	to obtaining a number of physician's services. They believe that non-pecuniary factors are more important in determining practice location (1979). Jon Gabel found that Medicare prevailing fees in counties with more than 100 physicians per 100,000 population are 21 percent greater than prevailings in counties with fewer than 25 physicians per 100,000 (1978). Hadley agrees that Medicare incentives do not support public and private efforts to encourage physicians to locate in underserved areas (1978).

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